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MAP OF COSTA RICA, SHOWING THE PRINCIPAL LOCALITIES AT WHICH PLANTS HAVE BEEN COLLECTED


PACIFIC OCEAN
CARIBBEAN SEA
BAHIA SALINAS
PENINSULA DE NICOYA
GOLFO DE NICOYA
GOLFO DE DULCE
GOLFO DE PAPAGAYO
BAHIA DE SALINAS
Nicoya
Cartago
San José
Heredia
Alajuela
Puntarenas
Limón
Bagaces
Liberia
Nicoya
Santa Cruz
Nicoya
Esparza
Orotina
Aguacate
Barranca
Abangares
Tilarán
Cañas
Bebedero
Colorado
Sarapiquí
Guápiles
Matina
Siquirres
Turrialba
Irazú
Poás
Barva
Heredia
Alajuela
Naranjo
Grecia
Atenas
Palmares
Esparta
Aguirre
Parrita
Quepos
Pirris
Térraba
Buenos Aires
Boruca
Pacuare
Reventazón
Tucurrique
Paraíso
Cartago
Tres Ríos
Desamparados
Puriscal
Turrubares
Dota
Tarrazú
Aserrí
Mora
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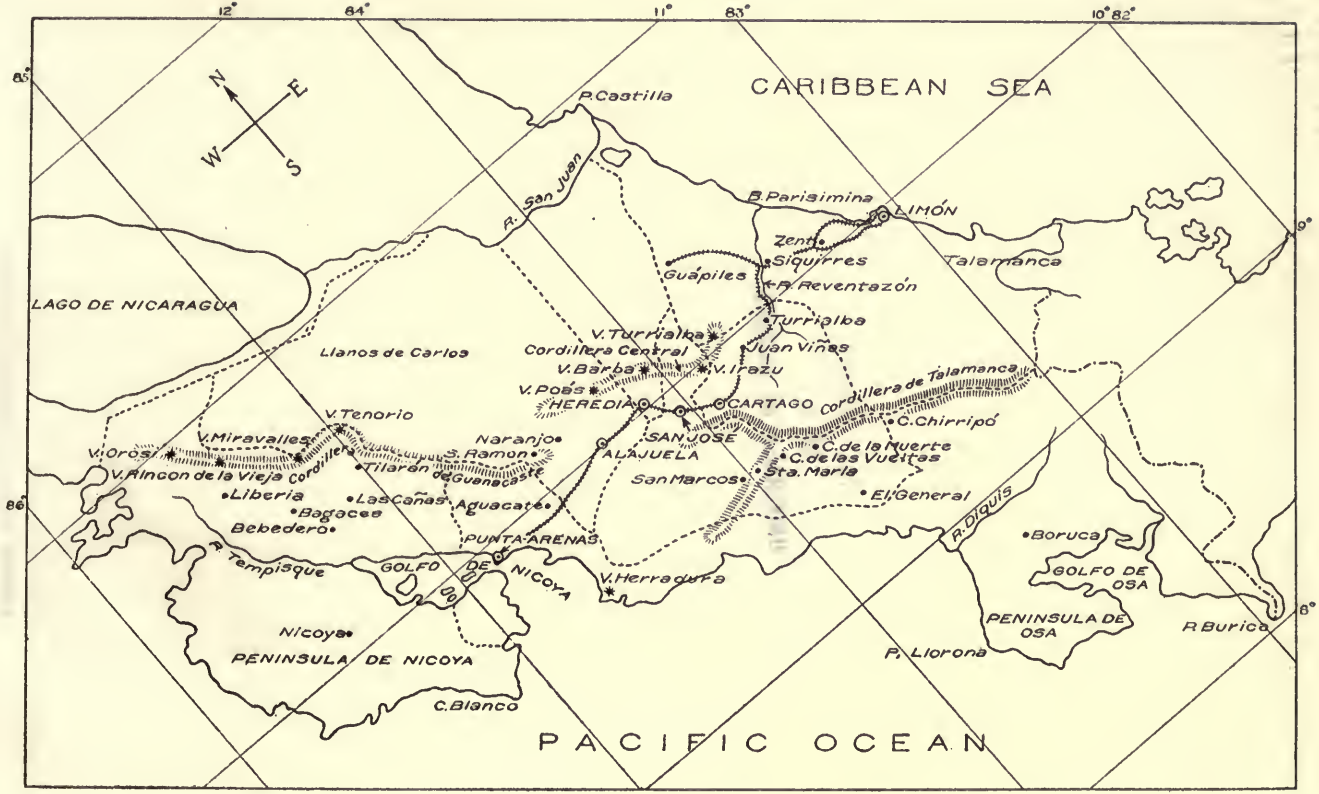


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BOTANICAL SERIES

FIELD MUSEUM OF NATURAL HISTORY

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# FLORA OF COSTA RICA

## PART I

BY

PAUL C. STANDLEY

CURATOR OF THE HERBARIUM, DEPARTMENT OF BOTANY

B. E. DAHLGREN

CHIEF CURATOR, DEPARTMENT OF BOTANY

EDITOR

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# FLORA OF COSTA RICA

Paul C. Standley

## INTRODUCTION

Preparation of manuscript for the *Flora of Costa Rica* has been the most agreeable botanical work that the writer ever has undertaken, for two reasons. No other area of equal size anywhere in America possesses so rich and varied a flora, and none in North America is at all comparable in these respects. It is improbable that in any part of the earth there can be found an equal area of greater botanical interest. In the second place, work upon the flora has enabled the writer to relive many happy days spent in Costa Rica in 1924 and 1925–26, while making collections and becoming acquainted with several separated and representative regions: the Meseta Central; the Atlantic and Pacific coasts; the Province of Guanacaste, so unlike and yet in some respects so similar to central Costa Rica; the volcanoes; the Cantón de Dota; and even the alpine paramos of Dota, the only ones, even if small and insignificant in comparison with those of the Andes, that exist in North America.

Working over these collections revived a host of memories of inspiring days spent in mountain and lowland forests, memories of the most varied kinds, all happy and pleasant ones. It is truly remarkable that in traveling so many miles, afoot, on horseback, and by other, often primitive means of transportation, there should have occurred no unpleasant incidents, nothing more embarrassing than minor failures of modern rather than primitive machines of transport. In few countries of the world, I believe, would it be possible to travel so much and find only pleasant and ever varied scenes, and be received everywhere with simple and sincere hospitality. Elsewhere in Central America the writer has always received most sympathetic treatment and most kindly hospitality from rich and poor, but in Costa Rica even the customary and expected courtesies have been exceeded.

It is unnecessary to expand this theme, for the writer has always been extremely enthusiastic in speaking of Costa Rica, and it would be difficult to develop the subject adequately. Suffice it to say that the country possesses a peculiar charm, in part based upon its great

natural beauty, with scenes that vary from densest tropical rain forest and jungle to semi-desert, the wildest mountain scenery, with steep scarps, majestic volcanoes, often with smoke issuing from their summits, lovely lakes, swift streams of clear, cold water; and alder-encircled pastures that recall the hillsides of New England. Costa Rica never has seemed to me a foreign country at all. Its atmosphere is homelike, and one feels immediately at home in any part of it.

Costa Rica's greatest resource is its people. Ask any Central American outside Costa Rica what is the best part of Central America, and the answer is always the same: Costa Rica. This is not only because of the great beauty of the land, but on account of its inhabitants, who are celebrated for their good schools and stable and truly democratic government. It is a land where no one is very rich and no one hungry. The term that best describes the Costa Ricans is the Spanish word *humildes*. In its best sense this expresses their naturalness, their dignity without affectation, their contentment, and their happiness. One can not fail to be impressed with the intelligence of the mass of Costa Ricans, and the high learning of many of them, which always is combined with a lack of affectation that compels the respect that well-based education always deserves and receives.

## PLANT GEOGRAPHY

Of the independent countries of the earth Costa Rica is one of the smallest. In flora it is one of the richest. Its area is approximately 18,400 square miles, about that of the State of West Virginia, which it somewhat resembles in rugged terrain, but upon an exaggerated scale. Bounded on either side by the Pacific and Atlantic (really the Caribbean Sea) oceans, it is scarcely more than a hundred miles in width, its longest axis running from northwest to southeast. Somewhere near this axis, but rather closer to the Pacific, it is transversed by the great cordillera that extends near the Pacific Ocean for almost the whole length of the two American continents.

Such, in brief, is the geography of Costa Rica. Land at either of its ports, but especially the Atlantic one, and look about you, and the geography seems far from simple. After spending a little time in the country, and trying to travel over it, even to the more accessible and more densely populated regions, you will agree that practically the geography is highly complicated.

So difficult is travel in Costa Rica, in spite of the railroad extending from coast to coast, and so many are the regions never visited

by a botanist, even for the most desultory collecting, that it seems presumptuous to attempt at this time to offer a flora of a region so rich floristically as this. It is for that reason, principally, that the present flora appears as an annotated list rather than a more elaborate work with keys and full descriptions, for the time has not arrived when an adequate flora of the country can be written. There is no doubt that the great majority of Costa Rican plants have been collected, and that most of the important ones are described, but to judge from what is known of the flora, it is certain that the number of species will be greatly increased, far beyond even the astonishing number enumerated on the following pages.

Why should so small an area possess such a vast number of plants, a number much greater than exists in any of the other Central American countries, most of which are much more extensive in area? Why should Costa Rica have such a stupendous number of ferns and orchids, groups in which few other tropical countries, no matter how great their area, can rival it? Why is it that in America such wealth of plant life can be found in no other area of equal size, unless it be in portions of Colombia, Ecuador, or Peru? These questions may be answered satisfactorily by an understanding of Costa Rican geography and climate.

In few tropical regions is it possible to find within such small compass so varied physical conditions. The surface of Costa Rica ascends from sea level to about 3,900 meters' elevation, an altitude above which, at this latitude, little plant life could be expected. Much of the provinces of Limón, Alajuela, Guanacaste, and Puntarenas consists of plains that rise gradually toward the mountains. About a third of the country is formed by high hills and mountains, of the most rugged character and the most involved structure. While upon the map one sees a neat chain crossing the country obliquely, in actuality this chain is much interrupted and bewilderingly complex in geography. All or most of the mountains are volcanic in origin; several volcanoes are almost constantly or intermittently active. Like most volcanoes, their slopes are steep and exceedingly rough, making travel over them tedious or even impossible. So difficult are conditions of travel that probably no one person has ever seen all the country, even superficially, despite the fact that so many Costa Ricans make long and frequent excursions on foot or horseback over their country. So difficult are means of communication that some of the richest agricultural lands have never been occupied. What motive can induce settlement in the productive valleys of

El General, since all produce, to reach a market, must be transported by a long and difficult route to the coast, then by boat to a port, and by railroad to the interior, or else carried on men's backs, or driven on the hoof, across the highest mountains of the country to market? Perhaps the airplane will solve this economic problem, as it has already done to a slight extent. The expense of building roads over such difficult territory is so great as to make them impractical for many years to come.

The writer has spent two winters in Costa Rica, making innumerable trips by various means of transport, and visiting as many regions as could be reached during the months spent there. As he looks back at the collecting thus accomplished, and the list of localities visited, it seems that a great deal of traveling was done, but a glance at the map shows the routes as only thin lines, almost lost upon its surface. Few other botanists have seen so much of the country, and, in spite of all this, we know that botanically Costa Rica has received much more than its fair share of exploration, as compared with most other parts of tropical America! There is much still to be learned about the flora of the tropics.

The plains of Costa Rica, in the departments of Limón, Alajuela, Guanacaste, and Puntarenas, have a sparse population. On the Atlantic coast the chief and almost the only industries are the production of bananas and cacao, both of diminishing importance in late years, although flourishing formerly. It was in Costa Rica that the export banana trade, now of such huge importance, had its birth. The Pacific plains, in Guanacaste and Puntarenas, are devoted to stock-raising, although in limited regions agriculture is followed.

The great majority of Costa Rica's population is concentrated in the upland regions, chiefly within a small portion of the departments of San José, Cartago, Heredia, and Alajuela. This elevated region, coinciding roughly with what is here called the *tierra templada*, is known commonly as the Meseta Central, although at times the latter term is restricted to the great valley between the two chief mountain ranges.

The high mountains of Costa Rica are arranged in two great chains running almost parallel. The northern and better known is formed primarily by the four great volcanoes, Turrialba, Irazú, Barba, and Poás, that overlook the Meseta Central, from any point of which at least one of them is visible. Northwestward the chain is continued by the low Sierra de Tilarán and the volcanoes of

Tenerio, Rincón de La Vieja, and Orosí, all of which except the first are quite unknown botanically.

South of this chain, and separated from it by valleys and low mountains, extends the shorter cordillera of Dota. This includes such high peaks as Cerro de La Muerte, Cerro de Las Vueltas, and Chirripó, the highest mountain of Costa Rica, and continues with little interruption to the Volcano of Chiriquí, in Panama, whose flora is naturally similar to that of the Costa Rican mountains. The flora of the more southern range, although it is little separated from the northern one, seems to possess a much closer affinity with that of the Colombian Andes.

The dominant factor in plant distribution in Central America is rainfall, moisture conditions being more or less uniform throughout corresponding parts of the region. Upon the Atlantic coast rainfall is heavy, in some places reaching 180 inches per year. Of greater importance is its continuity throughout the year, for while in some months rainfall is scant, there always is enough for luxuriant growth of vegetation.

On the Pacific coast rainfall is scarcely half as great, and periodic in distribution. During the *invierno*, May to September or October, the whole rainfall of the year is received. During the much warmer *verano*, coinciding with winter months of the North, there is little rain or more often none at all. For only half the year is there sufficient moisture for free growth of vegetation. During the dry months many plants are dormant, and many trees and shrubs shed their leaves. Crops can not be grown here during the dry season, but on the Atlantic coast they may be produced at all times of the year.

The mountains constituting the continental divide are the factor governing distribution of rainfall. During winter months they are an effective barrier against rain clouds driving inland from the Caribbean. These clouds are halted at the summits, but drift across upon the Pacific slope for a short distance. Ascending the Pacific slope of one of the central volcanoes during the winter, especially in early morning, it is easy to see how the moisture is distributed. On the lower slopes in March the fields are dry and brown, but at a certain level the dust in the road disappears, and the ground becomes progressively wetter and wetter. Immediately one notices that every tree is laden with orchids, ferns, and other epiphytes. It is to this line that clouds and mists descend at night.

Other factors affecting plant distribution are temperature and wind, the former dependent principally upon elevation, but partly

also upon rainfall. The mean temperature, in general, decreases as one ascends the mountains. The lowlands are hot, although seldom if ever so disagreeable as a hot summer day in central and northern United States. At middle elevations the temperature is delightful through all or most of the year. At San José the days may become rather hot during the dry season, but the nights are cool or cold. At Cartago, which has a considerably greater elevation, only the trite term of perpetual spring can properly describe the climate. There can scarcely be a more perfect climate, except that the nights are rather too chilly for one not born to the climate.

At 1,800 meters or higher the climate is really cold. The writer has suffered more from cold in Costa Rica than in all his life in the United States, and it is hard to recall a comfortable night spent in the uplands, even in a room almost hermetically sealed, which, unfortunately, is usually far from the case. Upon the Cerro de La Muerte and Cerro de Las Vueltas thin ice often forms at night. Although the temperature is sufficiently low for snow, this phenomenon seems to be unknown in Central America, although a few possible exceptions are recorded.

The only places where wind is an important factor are the tops of the highest mountains, principally those of Dota, and there it is questionable whether wind is so important as temperature. In the high mountains, especially at night, winds are all too frequent, often reaching the force of gales. Even at such a low elevation as Tilarán, in Guanacaste, the wind howls all night long, and it is disagreeable to be on the road at night almost anywhere in the mountains, especially if rain is falling.

Most celebrated for wind and cold is the Cerro de La Muerte, whose name indicates its somber reputation. A rather important trail, crossing it from El General to Santa María de Dota, has long been an important thoroughfare. Because of its dangers, the government has built shelters where travelers may take refuge from cold and wind if overtaken by night, or sometimes even in daytime. Horses seldom are taken across the paramo, for it is said that they are almost certain to perish. It is claimed the Indians, when they had to cross the Cerro de La Muerte, used to carry bundles of nettles, with which they lashed their bodies to increase circulation and enable them to bear the cold.

## ATLANTIC TIERRA CALIENTE

The Spanish term *tierra caliente*, generally used to designate the lowlands of Central America and other Spanish-American coun-

tries, signifies merely "hot land." As a term it is unsatisfactory, for it implies that the lowlands are regions of intense heat, which is not generally true. Some parts of them are uncomfortably hot, it must be admitted, especially desert areas, or those whose atmosphere is saturated with water in association with high temperature, but in general the lowlands are less uncomfortable than most regions of the United States in midsummer.

Pittier places the upper limit of the tierra caliente in Costa Rica at 1,000 meters, while Wercklé locates it at 800 meters. The former author gives 21°–28° C. as the mean temperature.

Entering the harbor of Limón, one has a good view of the Atlantic tierra caliente of Costa Rica. The scene is most lovely and impressive in early morning—in front a lofty wall of deep green, half veiled by low-hanging, fleecy clouds, swaying lazily like curtains stirred by light breezes. One does not realize the presence in the foreground of forested plains that extend for many miles inland from the coast, because only their edge is visible. The eye is held by the steep, green slopes of the high mountains, that appear to rise just beyond the port, but are actually many miles away.

The whole Atlantic slope of Costa Rica, from the sea to the tops of the mountains, except where cleared for cultivation, is occupied by dense rain forest of the type prevalent from southern Mexico almost continuously along the Central American coast, and far southward, at least to the mouth of the Amazon. If viewed from an airplane, nothing would be seen but a monotonous expanse of green, everywhere almost uniform in height, broken only by isolated peaks, and varied but slightly by lower mountains and hills.

When one is riding by railroad from Limón to San José, the landscape of the tierra caliente is monotonous, even to a botanist. To others uninterested in vegetation it must seem even less varied, for the view consists of little but forest, interrupted by an occasional glimpse of a swift stream, especially the roaring waters of the Río Reventazón. Here and there are plantations of bananas and cacao, but most of these are remote from the main line of the railway.

Along the Atlantic beaches is the usual type of tropical vegetation so widely dispersed in America and even on shores of Old World tropics. The sand is carpeted with mats of rope-like stems of goat-foot morning glory (*Ipomoea Pes-caprae*) and *Canavalia maritima.* In salt flats shallowly flooded at high tide are sparse colonies of halophilous grasses and sedges, with *Cakile, Sesuvium, Batis, Philoxerus*, and other plants. Just back of the strand, in places seldom

reached by the waves, are compact thickets of shrubs and small trees, their outer edges usually banked with low shrubs of *Caesalpinia Crista, Coccoloba Uvifera,* and *Chrysobalanus Icaco.* Behind the shrubs, or frequently at the very edge of the water and projecting far into it, are often large areas of mangrove swamp, with their customary association of *Rhizophora, Avicennia, Conocarpus,* and *Laguncularia.* Usually the coast is fringed with graceful coconut palms, which add the necessary touch of picturesqueness to every tropical shore. Beyond the coastal thickets and mangrove swamps stretch miles of unbroken forest, uniform in appearance to the casual observer, but to the botanist observing its elements infinitely varied.

Rainfall on the wide Atlantic plains of Costa Rica is so heavy that even the poorest soil can support a luxuriant vegetation. Some parts of these plains, only a fraction of which ever has been planted with bananas, are said to have very rich and productive soil, but much of the land in the wetter parts of Central America has the appearance of being sterile and probably useless for agriculture. It often consists of sticky red clay that collects heavily upon one's feet.

Where the forest has been cut, the ground cultivated for a time, and then abandoned, there often is a fine showing of bright-colored flowers, supplied by a large variety of shrubs and bushy herbs. Most plants that grow in these clearings are never seen in virgin forest, and one wonders what their habitat may have been before man altered the original disposition of the vegetation. If cleared land is neglected, it is soon covered with a lavish growth of herbaceous weeds, frequently six feet or more in height. By the second year there have sprung up coarse shrubs and seedlings of soft-wooded trees, which grow rapidly and soon form a low secondary forest. Growth of such plants is appallingly rapid, and the lowland settlements wage a constant fight to protect themselves from being overwhelmed with vegetation, which is growing every day in the year.

Weedy plants that repopulate clearings include such trees and shrubs as *Cecropia, Luehea, Apeiba, Triumfetta, Trema, Ochroma, Spondias,* various melastomes, *Belotia,* and dozens of others. The weedy plants are numerous in species and not confined to any special group. Away from the influence of tide water are many open or partly wooded swamps. The open swamps or marshes, often of great extent and affording homes for flocks of noisy aquatic birds, are rather uniform in vegetation. Dominant plants are the stiff-leaved *Calathea lutea* and *Thalia, Canna,* and *Cyperus giganteus.*

Other almost ubiquitous aquatic plants are *Sagittaria, Pistia, Nymphaea ampla, Pontederia rotundifolia, Eichhornia,* and *Limnanthemum.*

In another type of swamp in which the water is shallow, sometimes almost disappearing by the end of the spring months, and often influenced by the tides, there is a good growth of trees of such genera as *Mora* and *Pterocarpus,* and vast thickets of palms of the genera *Raphia, Corozo,* and *Manicaria.* A giant aroid with handsome inflorescences like callas, *Montrichardia arborescens,* grows abundantly in such places. These wooded swamps generally have a varied and interesting herbaceous vegetation, and numerous woody vines. One of their most beautiful flowers is *Passiflora vitifolia,* whose large blossoms are fire-red.

It is the upland forest that covers the major part of the lowland plains, the great plains of Santa Clara and San Carlos, the latter stretching far northwestward, almost to the Pacific coast. It consists of a dense stand of huge trees, often from 30 to 50 meters in height, occupying every available bit of land.

Entering this forest afoot or on horseback, the first feeling is one of bewilderment. One recalls the old remark about being unable to see the forest for the trees, a statement that here, especially for the botanist, is all too literally true. You are in a forest, with trees on every hand, but all you can discern in any direction is tree trunks and more trunks. You can not even guess at what they may be. For most botanists, unfortunately, tree trunks have little significance.

All the branches of the trees are so high overhead that one can form no idea of their foliage, especially because the branches of adjoining trees are interlaced, and even when leaves float down from their branches one never can be quite certain of the tree to which they belong. The only means of identifying these tall trees is to see them cut. Then it is revealed that they are astonishingly diverse as to species, and that pure stands of one species never, or very rarely, occur. Certain species often are especially abundant in a locality, but it is seldom that one dominates any limited forest area.

The most impressive feature of these forests is the vast height of the trunks and their gigantic diameter, especially when, as often happens, this is exaggerated by buttresses. A famous American naturalist a few years ago in a published account of Costa Rica remarked that he had never seen there any trees larger than those of the river valleys of Illinois. He wrote in his late years, long after he had seen Costa Rica, and his memory must have been at fault. I have seen many of the best existing forests of the eastern and

central United States, and none of their trees are comparable in size with those of the Atlantic forests of Costa Rica.

Because of the difficulty in obtaining material of them, it will be long before all the trees of the Atlantic plains are catalogued, but their principal components are well known. Among the more common ones are *Luehea Seemannii, Pentaclethra,* a great variety of Lauraceae in several genera, particularly *Nectandra, Ocotea,* and *Phoebe; Ficus* and *Coussapoa,* which often or usually begin life as epiphytes; species of *Brosimum, Ogcodeia, Perebea, Poulsenia, Symphonia, Hippomane, Minquartia, Virola, Compsoneura, Dialyanthera, Prioria, Dialium, Dipteryx, Zanthoxylum, Bursera Simaruba, Protium, Swietenia macrophylla, Vochysia, Terminalia, Manilkara;* the purple-flowered *Jacaranda,* probably the most brilliant tree of the Atlantic coast; *Castilla, Chrysophyllum,* and hundreds of others. While most species are well represented and some abundantly, others are rare. Examples are *Lecythis costaricensis,* and that odd tree, *Theobroma simiarum,* whose tall trunk is decorated with sausage-like fruits.

The rain forest has three or four different levels of foliage. Although the dense crowns of the tallest trees intercept most of the sunlight, usually there is a definite understory of small trees—small here, yet of respectable size if in a temperate zone. Prominent among them is a variety of palms of minor or medium size, notably in such genera as *Socratea, Welfia, Astrocaryum, Euterpe, Geonoma, Iriartea, Reinhardtia,* and *Chamaedorea.* Tree ferns are plentiful in some localities. *Zamia* often occurs in wide colonies. Of small and medium-sized trees of higher groups may be mentioned *Didymopanax, Pourouma, Carica dolichaula, Inga* and *Pithecolobium, Dracaena, Ravenia, Guatteria, Theobroma, Guarea, Posoqueria, Carapa,* and *Olmedia.*

Shrubs are numerous in species, although seldom closely spaced. They include species of *Piper, Heisteria, Siparuna, Swartzia, Quassia, Neea, Cupania, Pentagonia, Cephaelis, Rudgea,* and *Psychotria.* There are many woody vines—call them lianas if the word seems more tropical; the words are synonymous—some of them reaching the tops of the highest trees. Marcgravias are often plentiful, and such water vines as the wild grape (*Vitis tiliifolia*) and certain Dilleniaceae; several species of *Carludovica,* palm-like in foliage; Bignoniaceae of several genera, with bright-colored flowers that are seldom seen; *Allamanda; Rourea; Entada gigas,* with gigantic, bean-like pods; species of *Strychnos* and *Maripa;* and the prickly sarsaparilla (*Smilax*).

The light is so scant on the forest floor that herbaceous plants are typically sparse in growth. There are few grasses, and those vine-like in habit, like *Lasiacis*, or of certain genera with broad leaves, especially adapted to forest conditions, species of *Olyra*, *Streptachne*, and *Lithachne*. The herbs thriving best are certain coarse Monocotyledoneae, of such genera as *Heliconia*, *Calathea*, *Dieffenbachia*, *Renealmia*, *Costus*, *Xiphidium*, and their relatives, which often grow in the greatest luxuriance. These plants are perhaps responsible for the greater part of the scant color found in these gloomy forests, whose atmosphere is as sober as that of a great church, and almost as silent, at least for most of the day. One who expects displays of brilliant color in a tropical forest will be disappointed in the Atlantic rain forest, where usually no other color than dark green is visible from a given point.

The Heliconias often grow so luxuriantly as to form, in the case of the larger plants, like *H. Mariae*, dense and for all practical purposes impenetrable thickets. Their stems are almost as thick and solid as those of banana plants, and so closely set that one can scarcely pass between them.

An important element in these forests consists of epiphytes. From the ground you can see the coarser ones, festooning the trunks of almost every tree with rope-like stems and cloaks of huge leaves. On a recently fallen tree you will discover a host of others that are invisible from the ground. Some of the more freely branched trees support dozens of epiphytic species, ranging in size from minute lichens and hepatics to the largest aroids.

The aroids are probably the most showy and abundant of these epiphytes, especially species of *Philodendron* and *Anthurium*. The Monsteras attract attention because of their ample leaves perforated with large holes or "windows." Lush bromeliads are almost as conspicuous as aroids, particularly species of *Aechmea* and *Tillandsia*, all of which usually grow high on branches rather than on trunks. Many kinds of ferns are common, but mostly of relatively uninteresting and widely distributed species. There are a good many orchids, but no such abundance of species as at higher elevations. It is in this belt, however, that there is found the most celebrated of Costa Rican orchids, the *guaria de Turrialba*, *Cattleya Dowiana*, its lip crimson veined with gold. Vanilla likewise is a lowland orchid that thrives in dark, wet forest.

The ground covering of small, herbaceous plants seldom is very ample, but it is sufficiently varied. One might expect in such low-

lands to find only uninteresting and widely distributed species of herbs and such species are frequent enough; but it is here that one finds a good many endemic Costa Rican plants. I have often been impressed by their local distribution. In one place a certain rare herbaceous plant may be abundant, while in another forest area a few miles away, exactly similar in general appearance, perhaps not a single individual of the same species can be discovered. On this account it seems probable that many more endemic lowland species will be described from Costa Rica when such areas as the now almost unknown plains of San Carlos have been explored.

Acanthaceae, in wide variety as to color and habit, are a feature of the rain forest, also Commelinaceae. Several Selaginellas form lacy carpets over the soil. Terrestrial Araceae are not rare, and there are many dwarf plants of *Cyclanthus*, and huge clumps of *Carludovica palmata*, so much like a palm, except for its odd inflorescence. Low-growing Rubiaceae are rather numerous. The Cucurbitaceae are represented by large-leaved vines of the genera *Gurania* and *Anguria*, with small but handsome, orange and red flowers.

The Atlantic forests of Costa Rica have been neglected by most botanical collectors, who may have been eager to reach the more attractive regions of the mountains, more probably because they expected to find little of interest, or perhaps because of the lurking menace of malaria. It has seemed to me that in a land of so many interesting regions, this was one of the most profitable for exploration. Nowhere is it possible to find a greater number of plants that are likely to prove new.

## PACIFIC TIERRA CALIENTE

In practice, it usually is a long distance from the tierra caliente of the Atlantic coast to the corresponding belt of the Pacific. By air line the distance is not great, but in Costa Rica one does not travel that way. Between the two is usually an interval spent in the Meseta Central, and after that the Atlantic rain forest seems very far away. Then it is not surprising to find on the Pacific coast, at the same elevations—800 meters or less—altogether different conditions prevailing. So far as general appearance of scenery and vegetation is concerned, the two regions might be a thousand miles apart. Equally unlike are the species on the two coasts: most of them are different.

In the Pacific lowlands there is rarely much suggestion of the conventional type of tropical vegetation. The general appearance

is not so unlike western or southern Texas. For half the year, at least, there is less of green than brown and yellow. In the wet season the general hue of the landscape is not the deep, dreary green of the rain forest, but a livelier green, brightened by abundant sun, more like the vivid green of temperate lands.

The principal factor differentiating the vegetation of the Pacific tierra caliente is rainfall. The fact that a continental divide intervenes is probably of great importance, but not an insuperable barrier, since there are plenty of low gaps by which plants could cross it if the environment were favorable. As stated previously, rainfall on the Pacific coast is limited to half the year. The Atlantic forests are evergreen, those of the Pacific, such as they are, mostly deciduous, many of the trees and shrubs being leafless during much of the dry season, and many of the herbs dying if annual, or remaining dormant if perennial. A botanist can always find on the Pacific coast plenty of plants in flower or fruit, even at the driest season, and it is during the dry season, when travel is easiest, that most botanical exploration has been carried on.

The major part of the Pacific tierra caliente is or has been covered with either forest or thickets of more or less deciduous trees and shrubs. In general, the vegetation may be described as xerophytic. In gross aspect as well as in component species it is most unlike the Atlantic rain forest.

Most of the trees are smaller than those of the wet region, but there are exceptions, the ceibas, sandbox trees (*Hura*), and guanacaste (*Enterolobium*) having few rivals in size among Central American trees. These very large examples, however, usually grow as isolated individuals, or at least not densely crowded, as in the Atlantic forest. The trees of the Pacific forest usually are not crowded but generally rather widely spaced, and their tops are often broad and spreading, there being ample sunlight to induce free branching. Much of the soil in the Pacific tierra caliente is rather poor, and the rainfall is not heavy enough to compensate for soil deficiencies.

Descending by train from the Meseta Central toward the Pacific coast, one is impressed by the sparseness of vegetation, especially if the time is the dry season. Many hillsides and plains support but a scanty growth of plants, in which shrubs often are more conspicuous than trees. The land is so open that it affords natural grazing areas, and in some places trees and bushes have been cut to improve pasturage. Much of the Pacific tierra caliente is devoted to the cattle industry, which is the principal livelihood of this area.

There are cultivated fields of considerable extent in some parts, but crops are grown only in the rainy season or *invierno*.

In the lowest parts of the coast, toward the seashore, there often are dense thickets of low and tall shrubs, above which rise scattered trees. Here, as in the Atlantic tierra caliente, it is unusual to find a pure stand of any tree, but normally a large number of species grow in association. Sometimes, it is true, one species of tree dominates a locality, as the guanacaste and sandbox trees in much of the Province of Guanacaste.

In large areas of the Pacific tierra caliente, possibly because the land is too poor for the growth of many shrubs or trees, perhaps partly on account of seasonal fires, and probably because of still other conditions, there are no shrubs or trees, or only scattered ones, and the land is a grassy savanna. This type of vegetation does not extend north of Costa Rica except in insignificant areas, but it is well developed in Costa Rica, in Guanacaste and farther southeastward in Térraba and Boruca, toward the Golfo Dulce. Savannas are characteristic of Pacific Panama, and of many regions of northern South America, notably Venezuela and the Guianas.

These savannas are beautiful after the rains begin, when they are covered with fresh, bright green grass, and capable of supporting large herds of cattle and horses. The grasses, which often form a dense sward, represent numerous species, mostly plants less than a meter in height and often much lower. Among them grow many other plants, particularly a large number of Cyperaceae, and representatives of such genera as *Cipura, Polygala, Curtia, Melochia, Hyptis, Centrosema, Sauvagesia, Crotalaria, Eriosema, Stylosanthes, Zornia, Evolvulus, Buchnera, Ruellia,* and *Borreria*. There often is an abundance of small but brightly colored flowers. Water collects in shallow pools all over the savannas, and about these are borders of aquatic or hygrophilous plants, such as species of *Schultesia, Bacopa, Limnanthemum,* and *Nymphaea*. During the dry season the savannas are parched and brown.

Along the Pacific coast, as along the Atlantic, are mangrove swamps, with their peculiar association of species. The strand vegetation is nearly or quite identical with that of the Caribbean shore.

Among the principal large trees of dry Pacific forests are *Anacardium excelsum, Pseudolmedia, Licania platypus, Sterculia apetala;* various species of *Ficus;* guanacaste or ear tree, *Enterolobium,* one of the giants of Central American forests, and abundant in many regions, where it is an important source of lumber; *Platymiscium;*

*Pithecolobium Saman; Pterocarpus Hayesii; Sweetia;* Lauraceae in various genera although fewer than in wetter and more elevated regions; several Sapotaceae; *Tabebuia pentaphylla,* with gorgeous pink flowers; the almost equally showy *Triplaris;* the ant-infested *Cordia alliodora; Cassia grandis; Ceiba, Bombax,* and *Bombacopsis; Terminalia; Cedrela; Hura crepitans; Rheedia edulis; Gyrocarpus; Calycophyllum,* with sheets of white "flowers" and distinctive, pale, peeling bark; *Andira inermis;* Dalbergias, the cocobolo trees; and *Genipa Caruto.* Especially in evidence are trees of the family Leguminosae, and even more numerous are shrubs and herbs of the same family, the group of plants most abundantly represented in the Pacific tierra caliente, as in many other lands of similar climate in remote parts of the earth.

Of characteristic smaller trees of the Pacific tierra caliente one may mention *Dipterodendron,* with handsome, fern-like foliage; *Byrsonima,* which often forms extensive groves of distinctive aspect; several species of *Coccoloba; Tabebuia chrysantha,* with bunches of golden blossoms; *Hymenaea Courbaril; Crataeva;* a few species of *Caesalpinia; Cochlospermum,* often only a shrub, with flowers like yellow roses; a rubber tree, *Castilla nicoyana;* Cecropias, but much fewer than on the Atlantic coast; *Chlorophora,* the fustic or mora tree that furnishes dyewood; *Guazuma; Pourouma; Lacistema; Trophis racemosa; Plumeria acutifolia* with beautiful white flowers, produced when the tree is leafless; *Anona purpurea; Rollinia; Anacardium occidentale* with curious, edible fruits; *Psidium Guajaba,* which often forms groves or thickets, as does also the calabash tree, *Crescentia Cujete; Sloanea quadrivalvis; Diphysa robinioides* with racemes of yellow blossoms; *Esenbeckia; Simaruba glauca,* with edible, olive-like fruits; *Muntingia Calabura,* also with edible, intensely sweet fruits; *Gliricidia; Erythrina rubrinervia,* with pale-red, sword-shaped flowers; *Spondias purpurea,* with edible, plum-like fruits; *Pereskia; Trema micrantha; Licania arborea;* various species of *Lonchocarpus;* and *Bursera Simaruba.*

The shrubs of the Pacific thickets are legion in both individuals and species. While some, like the trees, reach the Atlantic tierra caliente, many, and probably the majority, are restricted to the Pacific coast. They include species of *Casearia* and *Gouania; Ouratea* with bright yellow flowers and leathery leaves; *Rauwolfia;* the abundant *Hamelia patens; Chiococca alba,* with pure white, disk-like fruits; numerous species of *Psychotria* (these are more plentiful in wetter regions); *Coutarea; Ruprechtia; Curatella americana,* the

sandpaper tree, distinctive in its rough leaves, often forming thickets of characteristic aspect; *Cassia biflora* and *C. nicaraguensis;* various Anonaceae, particularly the carrion-flowered *Sapranthus; Helicteres;* Melastomaceae, but of fewer species than in wetter regions; *Erythrochiton; Acacia Farnesiana; Psidium guineense; Triumfetta,* with burlike fruits; several species of *Capparis; Heisteria concinna;* several Solanums with prickly branches; *Ximenia; Mimosa pigra,* mostly in marshy places; bullhorn Acacias; *Prosopis,* chiefly on seashores; *Erythroxylon;* various species of *Acalypha,* especially *A. diversifolia.* There are many Pipers, but fewer than in wet regions. In the brushy thickets often are extensive areas so closely covered with Bromelias that they are impenetrable by any large animal.

In the Pacific tierra caliente grows the only tree cactus of Costa Rica, *Cereus Aragoni,* which may not be a native plant, according to statements of some authorities. Here abound palms of the genus *Bactris,* often producing an impenetrable undergrowth of stiff, spiny stems in places where water stands during the wetter months. An outstanding feature of the landscape in most of the Pacific tierra caliente is the coyol palm, *Acrocomia vinifera.* In thickets and forests are all too many plants of the sole climbing palm of the region, *Desmoncus,* with dangerously armed leaves. Other common palms are species of *Pyrenoglyphis* and *Scheelea.*

Epiphytes are scarce in most of the Pacific coast, but a few exist, especially Bromeliaceae, principally *Tillandsia* species, and, less frequently, hardy aroids. Orchids are scarce, but some showy ones grow upon the trees, species of *Laelia* and *Epidendrum,* and even the superb *guaria morada, Cattleya Skinneri.*

Woody vines thrive in the dry thickets and even in the forest, often in dense tangles over shrubbery. Many of them are Bignoniaceae with bright-colored flowers, produced at the end of the dry season. Likewise plentiful are Malpighiaceae, displaying masses of golden blossoms. Other common vines are *Vitis tiliifolia;* species of *Cissus,* often with long, pendent, aerial roots; the blue-flowered *Petrea; Trigonia;* the pink *Securidaca;* species of *Bauhinia,* the stems of some of them ribbon-like and perforated with holes, to suggest the common name *escalera de mono,* "monkey ladder"; species of *Mucuna,* a few with painfully irritant hairs on their large pods; and one or two species of *Combretum,* with showy, red and yellow flowers attractive to bees and hummingbirds.

The area designated as tierra caliente is, naturally, not sharply separated from the belt next above it, the two gradually merging

except where there is abrupt transition in climate, as may happen at the crest of a range of hills or mountains. Certain lower hills of the Pacific slope do not rise above the tierra caliente, while others bear on their summits small areas of different vegetation. The height to which the typical tierra caliente vegetation ascends depends largely upon rainfall, and in places where there is plenty of rain, especially if long continued, the tierra templada vegetation descends to a lower level, as in the region of Tilarán. Where the climate is markedly dry, the tierra caliente vegetation rises to higher levels. Its upper belts often remain green nearly or quite throughout the year.

While the vegetation of the Pacific tierra caliente is varied enough, and composed of a large number of species, botanically this is the least interesting part of Costa Rica. Certainly it is the least agreeable in which to work, for the climate is hot, the forest and thickets particularly so, and full of tangled vines and spiny branches, not to mention the ticks that thrive better than elsewhere. On this account, and for lack of good means of transportation, partly also because of the sparsely settled country, the Pacific tierra caliente has been relatively little investigated by botanists. Its exploration involves long rides on horseback on obscure trails, where there are few and often uncomfortable lodging places. It must not be forgotten that some localities on the Pacific coast are noted for a virulent type of malaria.

## TEMPERATE REGION (TIERRA TEMPLADA)

In relative botanical interest, the tierra templada ranks just above the Atlantic tierra caliente. Its flora includes large numbers of rare or unusual species, many of them endemic. It is the region in which most of the Costa Rican people live, the one in which all or nearly all the coffee is produced. Wherever in Central America coffee is grown commercially, the climate is agreeable.

Pittier locates the tierra templada between 1,000 and 2,600 meters in altitude and gives its mean temperature as 14°–21° C. These wide limits include practically all the uplands, excluding only the cold regions about mountain summits. It seems to me that Wercklé does better in placing the limits of the temperate region (the term is only a relative one) at 800–1,500 meters. That, as remarked, includes all the coffee region, and even extends somewhat higher.

This belt is one of transition, and not sharply marked anywhere, as so often is true of plant belts. It is no easy matter to indicate

species most distinctive of the area, because so many extend higher or lower, but the same may be said of most of the other regions more or less arbitrarily defined here. On the Pacific slope the so-called tierra templada is much better marked than on the Atlantic, for in the former it may be taken to include all mountain slopes at middle elevation that have a well-defined dry season. The upper limit is recognized readily when, in climbing the slopes of the volcanoes, one meets the line at which trees begin to be heavily infested with orchids, mosses, and other epiphytes.

On the Atlantic slope, where there is almost everywhere plenty of rain throughout the year, it is not easy to recognize any vegetation belts at all, except those marked by different types of agriculture. There the tierra templada may be roughly indicated as beginning in the region of Turrialba and Pejivalle, approximately where coffee cultivation begins, and extending up the volcano slopes to the fields where potatoes are cultivated, and to the pastures for dairy cattle.

Climate in some parts of Costa Rica plays strange pranks. If altitude alone were considered, the mountains of Tilarán in Guanacaste would fall wholly inside the tierra caliente, but as a matter of fact at only 750 meters they display almost the same vegetation seen in central Costa Rica at twice that elevation or more.

The explanation of this phenomenon is that here the continental divide is extremely low, only about 700 meters, and that rain-laden winds from the Caribbean coast are not wholly stopped by the summits of the mountains. The rain clouds drift westward across their tops, and throughout the year considerable rain falls on the west slope of the Tilarán range, which should be arid and parched during the dry season. The climate at Tilarán is the most curious I have encountered in Central America. Although the elevation is only 500 meters, in the dry months there falls almost all day long a fine mist, the *pelo de gato*, "cat fur," a very descriptive term. Although the sun is shining, in half an hour one's clothes become quite damp. There is a rainbow nearly always in sight. It is said that the name Tilarán, of Indian origin, signifies "the place where rain is always falling." In the town the fields are beautifully green, while only two or three miles away, toward the Gulf of Nicoya, everything is as dry and brown as a desert.

The tierra templada, as stated, contains most of Costa Rica's population, all the area mentioned on the following pages as the Meseta Central, and such important regions as Tilarán, Heredia, San José, Cartago, and Santa María de Dota. Because of the high

percentage of cultivated land in the tierra templada, its vegetation has been modified more than that of any other part of Costa Rica, and less remains of the former forest. Originally all or practically all the land was covered by heavy forest, centuries ago, for the large aboriginal population (attested by the abundance of pottery buried everywhere in the soil), must have cleared a good deal of land, and their Spanish successors have almost completed the work.

This is the best farming area of the country, nearly all of it, except where too steep, being suitable for some sort of agriculture. Costa Rica is fortunate in having available for its increasing population large areas yet unsettled, chiefly because of present lack of transportation. Such lands exist in the mountains of Guanacaste, on the more remote slopes of the central volcanoes, and in the difficultly accessible mountains of the Province of Puntarenas, as well as in the less distant region of Dota, and the plains of San Carlos.

Clearing of land is progressing constantly in some of those regions, and there probably are being destroyed a good many orchids and other epiphytes that never will be known to science. Many species must have passed out of existence thus in the central region. There is, for instance, a handsome ornamental shrub, *Bouvardia glabra*, common in Costa Rican gardens but unknown elsewhere, and not found recently in Costa Rica in a wild state. Probably it grew formerly about San José or Cartago, but has been wholly destroyed.

Originally the tierra templada must have been covered (except in Guanacaste) by a dense, moist or wet forest in which oaks (*Quercus*) predominated. In the more heavily populated valleys all these trees have been cut, except upon slopes too steep for cultivation, and even there most usable trees have been removed. It is possible to judge of the primitive forest about San José, Heredia, and Cartago only by fragments remaining in quebradas or on slopes above the cultivated fields, in such places as the beautiful Cerro de La Carpintera, near Cartago, and El Tablazo, near San José. About Santa María de Dota there are larger forests little disturbed, although even there the better forest lies in what is here called the tierra fría.

Other large trees associated with the oaks are great numbers of Lauraceae, especially species of *Nectranda*, *Ocotea*, and *Persea*, especially *P. Schiedeana* and *P. caerulea*; *Cedrela* or Spanish cedar; *Sapium*; *Inga* in several species; *Chaetoptelea*; *Talauma*; *Zanthoxylum*; *Podocarpus*; *Engelhardtia*; the endemic genus *Alfaroa* of the Juglandaceae; and *Ladenbergia*, a relative of the true quinine trees. Among smaller trees and large shrubs are numerous species of

*Croton; Citharexylum;* several woody Compositae, especially the white-flowered *Montanoa;* Myrtaceae, chiefly species of *Myrcia, Calyptranthes,* and *Eugenia; Urera* and *Myriocarpa;* three species of *Hedyosmum;* species of *Geonoma* and several other genera of palms; *Malvaviscus* and *Robinsonella;* Myricas; *Panopsis; Litsea; Arctostaphylos; Conostegia xalapensis; Hauya; Trichilia* and *Guarea; Roupala; Symplocos; Eurya; Cestrum aurantiacum;* and several white- or pink-flowered Rondeletias.

Among smaller shrubs Melastomaceae, Rubiaceae, and *Piper* are prominent, the last in greater numbers than at any other level. There are many shrubby Compositae, including species of *Calea, Vernonia, Eupatorium,* and *Verbesina.* In wetter parts of the Atlantic slope are innumerable red-flowered Gesneriaceae and Ericaceae, mostly epiphytic. Further groups well represented by species or individuals are *Solanum, Rubus, Clematis, Paullinia* and *Serjania, Calliandra, Palicourea, Smilax,* Myrsinaceae, *Siparuna,* and *Mollinedia.*

Immediately about Cartago and San José most of the native shrubs are to be sought in the dense roadside hedges so characteristic of all cultivated parts of Central America. Certain common shrubs are almost confined to hedges. Among the most characteristic shrubs and small trees of such places are *Xylosma, Randia Karstenii, Zanthoxylum Limoncello, Iresine Calea, Trichilia havanensis, Mauria, Acnistus, Picramnia, Cestrum aurantiacum,* and *Erythrina rubrinervia,* the last one of the most noticeable small trees of the tierra templada, although by no means confined to it. In the Meseta Central a delightful hedge or roadside plant is the *rosa de Castilla,* a rose with clusters of small, pink, double flowers that has become naturalized.

Herbaceous plants, both weedy and endemic or rare species, are an important element of the temperate forests. Among them are species of *Passiflora, Begonia, Lamourouxia, Salvia, Desmodium, Leucocarpus, Ipomoea, Ischnosiphon* (in Guanacaste), *Geranium,* ferns in great variety, including some tree ferns and numerous epiphytes; *Cuphea, Spigelia, Gynandropsis, Xanthosoma;* Heliconias; wide fields of *Eleocharis,* and many other Cyperaceae; *Canavalia; Loasa; Lopezia; Tibouchina, Centradenia,* and other small melastomes; *Gynandropsis; Zebrina;* species of *Juncus* and *Phaseolus; Valeriana; Coccocypselum.* Interesting among aquatic plants are the several Podostemonaceae that grow submerged on rocks in swift streams.

The pasture lands encircling San José and Cartago, especially the former, become dry during winter months, but in the rainy

season, and at Cartago for most of the year, they are beautiful with fresh, green grass and myriads of small plants with prettily colored flowers. Nothing is more pleasant during the wet season than a walk through the lanes about those places, with high hedges on either side, the road bordered with closely cropped grass from which spring many conspicuous flowers. Common plants of pastures are *Lamourouxia* and *Russelia, Lobelia laxiflora,* and *Kohleria,* all with red flowers; *Mimosa albida; Hypoxis; Desmodium; Parosela;* Polygalas; *Oenothera rosea;* Salvias; Vernonias and Caleas; *Sisyrinchium; Centaurium; Evolvulus; Dichondra;* Lobelias; *Eryngium Carlinae;* and several species of *Tagetes.* Lovely beyond description are the pastures of Cartago, on the lower slopes of Irazú, unbroken sheets of the beautiful hazy blue of Santa Lucía (*Alomia microcarpa*), which looks exactly like the Ageratum of gardens. Around Cartago and Santa María the cornfields often are invaded by tall plants of Santa Catalina, a dahlia with single or double, white or pink flowers, which behaves like sunflowers (*Helianthus annuus*) in the middle western states.

Epiphytes are plentiful in the temperate region, especially on the Atlantic slope. They are never absent anywhere, and are more varied in species than in the tierra caliente, although much less diversified than in the tierra fría. Orchids are sufficiently common, and many of the species are so ubiquitous as to rank almost as weeds. Here grows the beautiful *guaria morada* (*Cattleya Skinneri*). The country people often take numbers of large plants to their homes, and throw them upon tile roofs or on the tile covering of the adobe walls. There the plants thrive, and produce gorgeous masses of flowers in springtime. Another plant of similar habit is the endemic *Echeveria australis,* which is most at home on tile or dirt roofs.

Other common epiphytes are aroids, generally species of *Philodendron, Anthurium,* and *Monstera.* Epiphytic ferns are numerous, and there are plenty of mosses, hepatics, and lichens. The Cactaceae are represented by a few species of *Cereus* and *Rhipsalis.*

There are many fascinating collecting grounds for plants in the tierra templada, some of which have been celebrated among local and visiting botanists since the days of Oersted. Around San José so much land is cultivated that little representative native vegetation remains, but only a short distance away by bus are the hills of Escasú and Aserrí, where there are tantalizing bits of forest, with large numbers of rare plants. El Tablazo also is easily reached, the type locality for dozens of Costa Rican species. During the rainy season there is a fine showing of beautiful flowers in hedges and

pastures, but one is not likely to find there species of great rarity. With a horse it is possible to visit in a day the lower slopes of Irazú and Barba, although those regions, at least the ones conspicuously different from the environs of the city of San José, lie above the tierra templada.

At Cartago botanical conditions are much more favorable for a collector. It is an easy stroll up the lower slopes of Irazú, through grassy lanes bounded by weathered stone walls, to quebradas where there are many interesting plants, including the rarer endemic species. In such stream beds are scattered individuals of high mountain plants, borne by the current far below their normal habitat. Every roadside tree, large or small, bears a varied burden of epiphytes, orchids and the more conspicuous, brilliant-flowered bromeliads. The mountain air is so cool and invigorating that walking is a pleasure, especially where on every side there is nothing but beauty, wide meadows banked with forest, extensive views in every direction, upward to the summit of Irazú, southward across Cartago and the Reventazón to the mountains beyond Navarro and Orosi. Cartago charms every one who visits it.

South of Cartago, one or two hours by horseback, are some of the richest collecting fields of Costa Rica. The Río Navarro and Santa Clara compare favorably even with the forests of the upper mountain slopes, and it will be long indeed before their flora is completely known.

Unique among collecting grounds of the central region is the Cerro de La Carpintera, near Tres Ríos and Cartago, an elevated and isolated mountain that rises above the fields of Ochomogo, where was fought a famous and almost the only Costa Rican battle of the past hundred years. I have a special liking for La Carpintera, because it can be reached easily on foot from either Cartago or Tres Ríos, and because it has an extraordinarily diverse flora, which has yielded dozens of new species. This flora is, however, referable for the most part rather to the tierra fría than to the tierra templada.

The lower slopes of the mountain are cleared for grazing, and there are easy trails to the edge of the forest that covers the upper, painfully steep sides about the summit. Wood is cut at the edge of the forest, so that every year the trees are reduced in number. It would be a patriotic act if this last remaining bit of fine natural vegetation were permanently reserved as a national monument, that future generations might see how beautiful their country was in its primeval state.

The upper forest of La Carpintera is dense and wet, and difficult to penetrate. Nowhere in Costa Rica have I seen more varied and luxuriant vegetation. There is a profusion of rare trees, many tree ferns, a luxuriant growth of innumerable kinds of epiphytes, Ericaceae and Gesneriaceae, endless ferns, and a great variety of beautiful flowers. Along the ridges are tall plants of *Marattia*, one of the most primitive ferns, and of great rarity in Costa Rica.

The most memorable feature of a climb up La Carpintera is the fact that all day you are entertained by the roaring of a few *naulingos* that somehow manage to survive in their isolated and restricted home. Nowhere else so close to the cities of Costa Rica is it possible to hear the magnificent voices of these great black howler monkeys, the largest monkeys of Middle America.

One of the regions in the temperate belt best deserving the attention of a botanist is that of Santa María de Dota, south of Cartago and some sixty miles by road from San José. Situated on the Pacific watershed, its climate is relatively dry, decidedly so during winter months. Its most famous locality botanically is El Copey, appearing on even the smallest maps of Costa Rica, and consisting of half a dozen houses! There still is plenty of forest about Santa María, but little close to the village, and even this remnant is shrinking rapidly. From the settlement it is possible in a day's trip with a horse to reach many rich localities lying at greater elevation.

The vegetation around Santa María, while similar in many respects to that of San José and Cartago, shows manifest differences or at least is unlike anything now remaining at the latter places. On slopes near the town is a rather open oak forest, the trees often widely spaced and with spreading crowns, although even under such conditions exhibiting little resemblance to northern oak forests. Between them is a comparatively scant growth of shrubbery, with many characteristic species lacking elsewhere in forest. One of the most remarkable is *Dodonaea*, a shrub more usually found at sea level and most often on seashores.

Perhaps the most distinctive and profitable region in which the writer has ever worked in Central America is that of Tilarán where, in company with Professor Juvenal Valerio, he spent approximately the month of January, 1926. Reference already has been made to the unique climate and physiography of Tilarán. Botanical interest arose primarily from the fact that it was virgin land for exploration, and even more from its surprisingly rich and varied flora, which

abundantly justified our hopes. An unexpectedly large number of new species was discovered.

Not the least important element contributing to the success of our excursion to Tilarán was the hospitality of its people, who showed an intelligent interest in our work. The land about Tilarán has been settled in recent years by people from the Meseta Central, who form an oasis in the otherwise almost Nicaraguan culture of the Province of Guanacaste. The somewhat primitive but prosperous and comfortable conditions prevalent at Tilarán suggest pioneer days in the United States, which likewise were noted for their hospitality.

The most vivid impression of Guanacaste—the small part of it that I have seen—is of its abundant animal life. Along streams running into the landlocked Gulf of Nicoya are countless flocks of aquatic and other birds. Every tree along the rivers supports colonies of them, noisily flapping about their nests. Evidently they are little molested, for they pay slight heed to passing boats.

More astonishing than the birds are the mammals, and above all the monkeys. Contrary to popular and generally erroneous pictures of the tropics, monkeys seldom figure in a tropical landscape; in such places as Panama and Salvador, or even Honduras, you may spend a long time in the forest and see not a single one. But if I described literally the abundance and tameness of Guanacaste monkeys, particularly the big black howlers elsewhere so shy, along the country roads or even on the very edge of the village of Tilarán, I should not be believed. They are so tame that they seem quite indifferent to man, and their numbers are beyond belief. Traveling the roads one is accompanied by their roaring, that suggests nothing so much as the rumbling of a gargantuan coffee mill, and is one of the loudest sounds made by any animal.

It is quite defensible to assign to the temperate region the westward slopes of the Sierra de Tilarán, for their flora is strangely like that of the woods about San José and Cartago, where the elevation is twice as great. The Atlantic slopes of the same mountains, being dripping wet, support a flora definitely referable to the Atlantic tierra caliente.

Although the Tilarán flora is so like that of the Meseta Central, it differs in important respects. Oaks (*Quercus*) are said not to grow in Guanacaste, and I saw none; neither are there members of the genus *Rubus*, so well represented in the central regions. Nevertheless, the flora is sufficiently similar to remind the settlers of their

former homes in the Meseta Central. It is also, I judge, much like that of the incredibly rich region of San Ramón, where Professor Alberto M. Brenes has made such comprehensive collections.

The Tilarán forests are infinitely varied in composition, with much the same groups of trees that have been listed for the tierra templada. The undergrowth is unusually dense, so tangled that often it is impossible to enter it without a machete. Rich pastures of tall, rank Guinea grass exist where forest has been cleared, and the climate in some places is excellent for coffee production. As previously stated, a short distance often makes a great difference in agricultural potentialities of Guanacaste land. One landowner whom we visited remarked in all seriousness that on his finca of only moderate extent there were practically three distinct climates.

Another outstanding and well-defined temperate region I have visited is the lower slopes of the Volcán de Poás, above Alajuela. They have few inhabitants, chiefly, it seems, because the land is unproductive. Much of it is open, and perhaps formerly under cultivation, at least by the Indians, who must have been numerous there, and wide stretches are covered with bracken (*Pteridium*), whose presence is usually considered an indication that land has little agricultural value. There are numerous fincas in some parts of the slopes, and especially at lowest elevations most of the natural vegetation has disappeared. In the quebradas are dense growths of rather small trees and many shrubs, and some of the densest thickets of tall bamboo to be found anywhere in Costa Rica. Bamboo thickets are a customary feature of the highest mountain slopes, but they are not a usual type of vegetation on the lower flanks.

## COLD REGION (TIERRA FRIA)

The fame of Costa Rica's flora for bewildering variety and exquisite beauty is based primarily upon the vegetation of the tierra fría, and when one comes to discuss this portion of the plant life, one is appalled by the complexity of the task. Only the vocabulary and the descriptive genius of a Reginald Farrar could do justice to the subject. I am sure that the plants of the Chinese mountains upon which he lavished his incomparable vocabulary hold no superiority in beauty and variety to those of the high mountains of Costa Rica.

If a botanist has only a short time to spend in Costa Rica, he should hasten to the upper slopes. He will never forget what he sees there of profuse vegetation, and he will have seen, no matter

how long he remains, only a small fraction of the whole. For many years botanists have been visiting La Palma de San José, the place at which this type of vegetation is mostly easily reached from the capital, but late visitors find there many plants never seen or at least never collected by their predecessors. It still seems possible to discover almost as many new species as when La Palma was first visited by a botanist. After seeing the region, it is easy to understand why this is true.

The variety of vegetation in the wet tierra caliente is well known, but it is monotonous uniformity in comparison with what exists in the high mountains. In all North America no region can compete in variety of vegetation and number of species with the higher mountains of Costa Rica, except the similar adjoining Province of Chiriquí in Panama. In all the Americas it is improbable that any region is at all comparable, except the mountains of Colombia, with their related flora, or certain regions of the eastern slopes of the Ecuadorian and Peruvian Andes.

Pittier, as before stated, limits the tierra fría to regions above 2,600 meters, with a mean temperature of 5°–15° C., and there is no doubt that the small area so circumscribed does possess a distinctive flora. It seems to the present writer preferable to follow Wercklé, who applies the term tierra fría to all slopes above approximately 1,500 meters. If this is done, it is necessary to subdivide the cold region into two belts, lower and upper, the upper representing the tierra fría of Pittier.

The lower belt of the cold region, then, is an area of dense forests (except where modified by man), the forests composed of small or only medium-sized and densely crowded trees. Their tops are drenched every night and sometimes all day with drizzling rain or heavy downpours, and much of the time they are half hidden by drifting clouds and fog. If you touch a tree or bush you are showered with cold water. Every branch and trunk is swathed in epiphytic vegetation, which is dripping wet. The bunches of mosses, hepatics, and lichens are like saturated sponges. One's feet never touch dry soil.

Agriculturally the cold belt is the region of potatoes and the dairy industry. Wherever you go, you will eat potatoes and eat (clabbered) or drink milk, very likely potatoes boiled in milk, or, at higher elevations, the potatoes may be lacking. We once spent a night at one of the high ranches where so far as could be seen the people (we were well supplied with food ourselves) had nothing to eat except milk, and what game they could kill.

The term tierra fría is an accurately descriptive one, for the climate is really cold. There is nothing in the temperature to remind one of the tropics, no matter how tropical the vegetation may appear. I have spent a good many nights in the tierra fría of Costa Rica, as well as in the corresponding belt in other countries of Central America, and I can remember only two when I was comfortably warm while sleeping—one of those was spent on an open veranda! The native people have to be accustomed to the cold and wet, but the children, at least, suffer severely, and often have hacking coughs that bode no long or happy future.

The effect of the cold is intensified by the dampness, for in these regions it is impossible to keep any object dry. Outside the house one's footwear is always wet. Only the tightest houses, and they are few indeed, are impervious to the cold winds and rain that bluster throughout the night.

By day rains are less persistent, but they are often followed by dense fogs, dangerous for the stranger or even the residents themselves. In regions where fogs prevail, and elsewhere in the uplands for that matter, it is unsafe for a stranger to venture far without a guide; it is a careless host who permits him to do so. I have had few more painful half hours than once in the high mountains of Costa Rica when, after sending back to the house a guide who had proved himself a hindrance to the work I was doing, I suddenly realized that I did not know just where the house was from which we had started.

Another danger that may deserve mention in this place is that of falling branches. Most of the taller trees bear such a heavy load of epiphytes that a wind sends branches crashing noisily to the ground. Especially in the higher mountains it is unsafe to wander through a forest when much wind is blowing. After the end of a gale, it is possible to make a rare haul of epiphytes from fresh branches strewn upon the ground. It is even more fortunate to reach a place where tall trees have been cut recently, but the majority of the epiphytic plants wither on fallen trees in an astonishingly short time.

The reason why these wet mountain forests still yield so many new plants to even the most casual collector is that one person can never see more than mere fragments of them. No collector, unless giving his whole attention to some limited group, will travel far through them in one day, for he will be unable to carry away specimens of the plants he finds. Almost anywhere in the region, if a collector experienced in the tropics will follow a trail along a forest,

at the margin of a meadow, and collect all the plants he sees, none or scarcely any of which will be common ones, in two hundred yards he will gather more specimens than he alone can transport. One wholly unfamiliar with such places will be so bewildered that he can only pick here and there at the most brilliant or curious bits of vegetation, and will overlook the great majority of the plants, many of which, particularly among orchids and ferns, are small and unobtrusive.

Originally all these mountain slopes, except in the highest parts where there are paramos or paramillos, were densely covered with forest. It must have been discovered in comparatively recent years that the upper slopes, when cleared, made excellent pastures if seeded with European grasses, and thus many fine collecting grounds have become accessible to the botanist.

Formerly, as now to some extent, the populated Meseta Central was isolated from the Atlantic coast by mountains that were everywhere densely forested. These forests were penetrated only by a narrow, paved cartroad that crossed the divide between Barba and Poás, and descended to the San Juan River. The roads were so long and steep that people who could afford the cost, as I have heard very old people relate, were carried along the trail in chairs on the backs of professional *cargadores*.

At present it is easy to reach hundreds of places on the upper slopes where dairy farms exist, by roads which, if often painfully steep and boggy, can at least be traversed on horseback. The places thus accessible are so numerous that no one person ever has seen them all, although all lie within a region of no great extent, as the earth's surface is measured.

Each of these many isolated localities yields plants seen nowhere else. It is a remarkable fact that one may go to any secluded nook on the slopes of Barba, Irazú, and Turrialba, whose floras seem to be richer than that of Poás, and find there an always surprising number of showy and conspicuous plants. At another spot in the next quebrada, or in one three or four miles away, there may be an altogether different or at least conspicuously different association of species, in which many of the most conspicuous plants of the first locality are absent. On this account, when visiting a certain area it never is safe to pass a desirable plant, for it may never be seen again.

Many of the species seem to be extremely local in distribution, and this is true of some of the showiest ones. Good examples are

the two species of *Wercklea* (Malvaceae), trees with huge, bright-colored flowers that can not be overlooked. Each species is abundant in certain limited localities on the slopes of Irazú, but they do not grow together, so far as known, and each is known from a single station in the central mountains. Both do grow in other parts of Costa Rica and, I have no doubt, at other places on Irazú and Barba. Some of the most showy plants, naturally, are rather general in distribution, and may be seen almost anywhere one goes.

A catalogue of characteristic trees of the forests of the cold region would include almost the whole mountain forest flora of Costa Rica, but there are certain species, genera, or families that are particularly well represented. Large areas, in Dota up to the edge of the paramo region, are covered with *Quercus* in almost pure stands. It may be remarked that often it is difficult to determine what a particular tree may be, for it bears so many woody or herbaceous epiphytes that their foliage is much more prominent than that of the host itself. Conversely, often it is hard to decide whether a certain branch represents the tree or an epiphyte.

*Podocarpus* is another genus typical of the higher mountains. *P. oleifolius* is not a conspicuous tree, because its branches are so high above the ground, but *P. montanus*, on account of its fir-like foliage, with leaves white beneath, is more easily discerned. Lauraceae are everywhere numerous, with several genera and a fair number of species. On many slopes the Weinmannias, most frequently *W. pinnata*, are more plentiful than any other trees, and small trees of Melastomaceae, especially of the genera *Blakea* and *Topobea*, are often dominant. In many open places are groves or thickets of *Alnus* and *Vismia*. Other large and small trees occurring in some abundance, generally or locally, are Araliaceae, especially *Oreopanax*, in great variety, some with strikingly handsome and well-differentiated foliage; *Prunus; Morus insignis*, with greatly elongate but inedible fruit; *Magnolia;* endless tree ferns, including the largest individuals of the whole country; various Myrtaceae, especially species of *Eugenia* and *Myrcia; Hedyosmum; Gaiadendron*, with showy, bright yellow flowers; *Drimys Winteri*, a relative of the magnolias, with glaucous leaves, pungent bark, and small, white flowers; slender Phyllonomas, whose minute flowers issue from the upper leaf surface; *Brunellia; Pithecolobium* species of the subgenus *Cojoba; Fuchsia arborescens*, which becomes a round-topped tree of some size, especially if isolated in pastures; the two species of the endemic genus *Wercklea*, one with mauve, the other with pumpkin-

yellow flowers as large as those of hollyhocks; *Eupatorium fistulosum*, with huge leaves and panicles of vividly purple flowers; *Sambucus; Styrax*, with dead-white flowers; *Symplocos; Myrica; Sapium;* very numerous Rubiaceae, mostly species of *Psychotria, Palicourea*, and *Faramea;* numerous Myrsinaceae; the lovely pink-flowered *Hydrangea Oerstedii*, which usually is a high-climbing vine; *Bocconia;* numerous Guttiferae, especially species of *Clusia*, with waxy, white flowers, fragrant like orange blossoms; *Solandra*, with trumpet-shaped, white corollas similar to those of *Datura;* several species of *Ilex;* the Icacinaceous tree *Calatola*, which sometimes grows at lower elevations, as in the region of Dota; and the flaming red-flowered *Billia*, related to the buckeye (*Aesculus*) of the North.

Among small shrubs Pipers are plentiful, exhibiting here as much diversity as almost everywhere else in Costa Rica. There are numerous species of *Rubus*, usually forming thickets in or at the borders of clearings. The one with the best fruit is *Rubus glaucus*, whose handsome berries are deliciously flavored. Several Senecios with yellow or white heads are much in evidence in some localities. One of the showiest shrubs of the slopes of Irazú is *Solenophora calycosa* (Gesneriaceae), with trumpet-shaped, dull yellow flowers dotted with purple and as large as a small coffee cup.

On the upper slopes of most of the higher mountains are interlaced thickets of tall bamboos, growing beneath the forest trees. These tangles are so dense that it is necessary to cut a trail in order to pass, and scarcely any other plants are found among them. The ground usually is covered with a deep mulch of their fallen leaves.

As might be expected, palms are far less numerous than at lower levels, but there are a good many species of such genera as *Euterpe, Geonoma*, and *Chamaedorea*, especially the last, whose representatives are low and graceful, slender palms of handsome appearance because of their often brightly colored fruiting spadices. Woody vines are conspicuously few on the upper slopes; mention already has been made of the native *Hydrangea*. On the slopes of Irazú a famous plant is the *flor del volcán, Solanum Wendlandii*, with large clusters of vivid blue blossoms, which have made the vine a favorite in cultivation. *Muhlenbeckia* drapes old stumps and trunks. Several species of *Carludovica* with biparted, palm-like leaves cover the tree trunks, but these distinctive plants are fully as much at home in the tierra caliente, perhaps more so.

The tierra fría is the region *par excellence* of epiphytes. Conditions are ideal for their growth—moderate shade and constant,

abundant moisture. First in interest are the orchids for which Costa Rica is famous. In the tierra caliente, if moisture is sufficient, there are plenty of orchids, but few are seen because they are so high overhead on branches of tall trees that they can be reached only when a tree is felled. In the tierra templada orchids are much more plentiful than in hotter regions, and some localities, like those south of Cartago and the environs of San Ramón, have yielded great numbers, but even there many of the orchids grow on the taller trees, where it is impossible to collect them except when trees have been felled. But when, ascending the slopes of the volcanoes that overlook the Meseta Central, one comes to the cloud line previously described, one realizes that there at last is the paradise for orchid hunters.

The trunk of every low tree beside the road bears several large clumps of orchid plants. Dismount from your horse, inspect the tree closely, and you will discover dozens of small plants invisible from the middle of the road, species of *Pleurothallis*, *Stelis*, *Lepanthes*, etc. Lift your eyes to the branches, and you will see that every one has small and large clumps of orchids perched along it. The trees are so low, with heavy, broad tops like apple trees, that it is easy to climb into them, and upon any random tree one interested in orchids can find enough to keep him busy for some time. In any other country of Central America one such tree would be a boon, but here are countless thousands, and on every tree one may expect something quite new, not only of orchids but of other groups of plants. It is because of this great diversity and the immensity of the field that it may be stated confidently that the number of orchids known from Costa Rica will be vastly increased with time.

Let no one suppose that the abundance of orchid plants involves a profusion of orchid flowers such as may be seen in orchid houses of the North, for that is far from the case. Orchid species with large and showy flowers are few, and their blooming season seems to be usually short. Yet on every trip one may have the thrill of discovering a few clumps of perfectly flowered Miltonias, varied Epidendrums, Oncidiums, and hosts of others. There are few more delicately beautiful flowers than a thrifty clump of the lovely *Epidendrum Endresii* (certainly to be envied is the orchid collector for whom it was named), with its panicles of small, white and purple blossoms.

It is not true that small-flowered orchids lack beauty—they merely are not showy. Some of the almost minute flowers, if ex-

amined closely, prove quite as beautiful and even more intricate than the large ones, but they never will be popular in foreign lands—fortunately, since so many of the showiest orchids of tropical America face extinction by commercial collectors.

Well known to botanists are the orchids—some of them—of La Palma, a paradise indeed; but dozens of other localities are equally productive or better, and in the Costa Rican mountains are hundreds of other promising places never discovered by a collector. Locate a clearing anywhere in the higher mountains, cattle pastures or small openings made apparently by nature, perhaps relics of former small clearings made by man, and you are certain to find all the orchids you will be able to care for. They are abundant as to both species and individuals. From any one of these favored spots it would be possible to carry away wagonloads of orchid plants, if one were inclined to such vandalism.

Popularly orchids are associated with hot, dense forests, but they do not develop best in either heat or deep shade, the great majority of them at least. They thrive where the climate is cool or even chilly, and orchids, except the smallest and most delicate, require plenty of light. The richest collecting grounds are not inside the dark forest but at its outer edge, where the branches are exposed to abundant sunlight.

Orchids are but one element of the epiphytic vegetation of the tierra fría, and not the most voluminous one. Probably the greatest mass of epiphytes consists of mosses, hepatics, and lichens, the last least in evidence. Mosses and hepatics serve a useful purpose as sponges, to maintain abundant moisture at the bases of orchids and other larger epiphytes. Every limb is shrouded in them, so that usually nothing of the bark is visible. From every branch dangle feathery streamers of mosses and hepatics. These same plants exist also on the ground, but in lesser quantity.

For one interested in ferns there is probably no richer field on the whole earth, for the number of ferns in these dripping forests is beyond belief. The best region for them I have seen is the upper slopes of Turrialba, where there seems really no end to them. They cover every tree, and almost as many others grow profusely over the ground. Many hundreds of species have been collected in Costa Rica, many of them still without names, and possibly almost as many more await discovery. They represent most of the known genera, but are particularly numerous in such groups as *Polypodium*, *Asplenium*, and *Elaphoglossum*. It is here that the delicate filmy

ferns (*Hymenophyllum* and *Trichomanes*) find a congenial habitat, their fronds always bathed in water. Lycopodiums, likewise mostly epiphytic plants, are almost confined to this belt.

Aroids, especially *Anthurium* species, are very abundant but not particularly showy. They attract notice because of the varied shapes of their leaves, and some have curiously colored spathes or fruit spikes. Bromeliads are exceedingly conspicuous and often confusingly abundant. They continue so up to the very limit of woody vegetation, some of the largest and showiest of all Costa Rican bromeliads being confined to the highest thickets. Well represented there are the genera *Thecophyllum*, *Vriesia*, and *Guzmannia*, not to mention the Tillandsias, which range from the coast almost to the limit of vegetation. Many bromeliads are far showier than any orchids, with clean clusters of leaves and brilliantly colored inflorescences, the bracts often intensely red or pink, and the petals blue or white.

Important in numbers and diverse in foliage, but possessing few claims to beauty, are the many Peperomias that grow on the upper slopes, but these epiphytes are found in equal or greater profusion at middle or lower elevations. Everywhere, too, are Pileas, which may be either epiphytic or terrestrial. Among the strangest of the epiphytes are several species of *Utricularia* that often are mistaken for orchids. *U. Endresii*, with large, rose-purple flowers, really is quite orchid-like in appearance.

The most prominent flowers of the uplands are produced not by orchids but rather by groups which, if represented at all in the North, are not noted for showy blossoms. The profusion of bright flowers in the upper mountains of Costa Rica reminds one of the wealth of color in alpine parks of the Rocky Mountains, the upper slopes of the White Mountains of New Hampshire, or meadows of the mountains of North Carolina and Tennessee. Nature is all too prodigal of yellow, a quite practical hue that wears well, but becomes excessively tedious when overdone, as in most parts of North America. In the Costa Rican uplands one is for once freed of the dominance of yellow. While there are no wide meadows filled with color, there are reckless displays of the most lively hues, and not yellow but reds and pinks, mixed with some white and blue, predominate.

It is probably epiphytic shrubs of the tribe Thibaudieae of the family Ericaceae that contribute most to this riot of color. They are small or large shrubs that abound at almost every forest edge.

They are not confined to such high elevations, for they are familiar enough in the lower hills beyond Cartago, but wherever they are, no matter how great their abundance, they always seem fresh and new, and one is never sated with them. Each individual flower is so perfect, so fresh, so beautifully and variedly tinted, that each plant seems a new discovery. These fine shrubs have decorative foliage, often bronzed or painted with red and pink, the bracts are as intensely colored as the flowers, and the corollas present many shades of red, pink, and white. Beautiful, too, are the scarcely less abundant Gaultherias of the same family, very unlike the northern ones in habit of growth; and graceful and dainty are some of the epiphytic species of *Vaccinium*.

Another group of epiphytic plants with gorgeously colored flowers is the Gesneriaceae, which are legion in Costa Rica, and infinitely diversified in habit, form, and color. Pre-eminent are the Columneas, rather coarse in habit, and ordinary in foliage, but with the most gaudy, bright red or orange-red flowers. They are scarcely less abundant or conspicuous than the Ericaceae. Strange are the scandent Campaneas, with bell-shaped flowers suggestive of Gloxinias, luridly colored in green and brown, and dangling on cord-like peduncles far below the supporting branches. Not all Gesneriaceae of the tierra fría are epiphytes. There are many herbaceous or half-woody terrestrial plants, especially in the genus *Besleria*, but most of these have far less vivid flowers.

A further group of red-flowered plants is the Lobeliaceae, one of the families best represented and most conspicuous in these upper regions. They are either epiphytic or terrestrial, the latter more numerous. Their flowers are prevailingly red, often with some admixture of yellow, or they may be green or green and purple. The genera *Burmeistera* and *Centropogon* have many species in both middle and upper regions of Costa Rica, and, while their foliage is mediocre and their habit often ungainly, their flowers, if not so beautiful as those of Ericaceae and Gesneriaceae, yield nothing to them in brilliance of color.

Among the epiphytes are a few species of *Eupatorium* with white, pink, or purple heads. The prettiest is *E. eximium*, with neat, succulent leaves and vivid pink flower heads. Species of *Senecio* and *Liabum* supply all the yellow needed to vary the color picture. The white clusters of *Metternichia* cover many half-decayed stumps, often in company with festoons of *Marcgravia* and *Ruyschia*. The Marcgravias, while represented even in the tierra caliente, attain

greatest luxuriance in the cold regions. Their foliage is most decorative, the young leaves usually tinged with bronze and red. Further tints of the same colors are exhibited by the bizarre flowers, or rather bracts. Epiphytes are rare among the Rubiaceae, but in these forests two genera have adopted this habit, *Ravnia*, with bright red, tubular corollas little suggestive of the family to which they belong, and *Hillia*, with pure white blossoms.

In the tierra fría, as at lower elevations, herbaceous plants play only a minor role in the forest, but there are more of them in open places, or at the margin of the forest. Among the characteristic groups are Acanthaceae, some with handsome blue, white, or red corollas; *Hydrocotyle; Hemichaena*, with bright yellow flowers, in Dota; *Cardamine; Monnina; Dysopsis; Symbolanthus; Sibthorpia;* and *Nertera*, with small, deep green leaves and bright red berries, reminiscent of its near relative, the partridge berry (*Mitchella*) of the United States. In wet forests high in the mountains of Dota grows a species of *Greigia*, the single North American member of this otherwise South American genus of bromeliads. On the slopes of the central volcanoes clumps of large herbs often are tangled with graceful foliage of a slender vine, *Cobaea*, decorated with bell-shaped flowers of delicate pink. Near it grows *Loasa speciosa*, a tall, coarse plant with large, pale yellow, bell-shaped flowers. Like most Loasas, it is well protected by a dense covering of long hairs that inflict more painful stings than any nettle.

In the densest forests of Dota one, if fortunate, may find three strangely familiar and welcome northern plants, *Conopholis*, *Monotropa*, and *Chimaphila*. In the same cantón grows an umbellifer, *Myrrhidendron*, that is most unlike its northern relatives in attaining the size of a large shrub, with foliage of corresponding dimensions. Two other conspicuous plants of upland forests are species of *Symbolanthus*, a gentian, and a *Gynandropsis* that sometimes bears brilliant red flowers, but more often only dirty pink ones.

The Costa Rican plant of most individuality, certainly one of those best known in the country, is the *higuera* (*Gunnera*), which suggests distantly by habit the garden rhubarb (*Rheum*). Its inconspicuous, greenish inflorescences are hidden beneath the foliage. The leaves are gigantic, the rounded and deeply cordate blades supported on stout stalks and sometimes almost two meters in breadth. The stiff *higuera* leaves serve well as umbrellas if one is surprised on some mountain trail by a rainstorm. I have seen half a dozen people trudging one after the other stolidly through pouring rain along a

slippery, muddy trail, each protected by one of the great leaves held by its stalk above his head.

It is not alone among the epiphytes that bright red flowers are found in the high mountains, for some of the terrestrial plants rival them in color. Most beautiful of them are the Bomareas, slender vines with profuse umbels of bell-shaped flowers, deep red, yellow, and green. Two other decorative plants with confusingly similar flowers of exactly the same intense shade of red are *Impatiens* and *Tropaeolum.*

One of the most delightful mountain regions of Costa Rica consists of the meadows in the upper, wettest belt that have been cleared for pasture. These are of wide extent, and are being enlarged yearly. They support large herds of dairy cattle, this being the only Central American country in which dairying is an industry of importance. From these high, isolated ranches a plentiful supply of milk is carried in metal cans on horses' backs every morning to San José and Cartago, and on the most remote ranches the milk is made into butter or cheese, the cheese of the Volcán de Turrialba being justly famous.

These meadows, except where unusually well drained, are almost bogs, their soil always muddy, and the close vegetation like a dripping sponge. In tracks made by cattle live myriads of little frogs, some of which have a call suggesting a silver hammer upon a tiny anvil. The grass is vividly green, and it is said there is no change in the appearance of the vegetation from one end of the year to the other.

After the trees have been felled, the meadows usually are planted with grass seed imported from Europe. Mixed with it as impurities are seeds of common European weeds, some of which have become firmly established here, as nowhere else in Central America. Many of them are familiar weeds of the United States, but others are rare or absent in most of temperate North America. Particularly pleasing are the mats of English daisy (*Bellis perennis*), which finds a moist, cool, uniform climate exactly suited to its growth. After attempting the difficult feat of growing daisies in the United States, it is a joy to see how they prosper throughout these pastures.

With them many other small plants abound, *Cerastium viscosum, Silene gallica, Ranunculus, Veronica, Lotus, Rumex Acetosella,* two or three species of *Trifolium* with white or yellow flowers, *Medicago lupulina, Taraxacum,* and a good many others. On the slopes of Irazú are colonies of foxglove (*Digitalis*), and in marshy spots along the walled lanes on the slopes of the same volcano are wild colonies

of callas (*Zantedeschia*). Elsewhere there have been planted long hedges of *Datura candida* with huge, pendent, trumpet-shaped, white corollas that exhale a heavy fragrance. Small groves of alder (*Alnus*) and isolated trees of *Fuchsia arborescens* and showy-flowered Cestrums often add picturesqueness to the pasture landscape.

Introduced plants, principally grasses, often dominate the meadow vegetation, but there is a large element of small native plants, few of them distinguished by showy flowers. Common among them are *Sisiyrinchium* with either blue or yellow flowers; Alchemillas; *Trifolium amabile*, the only native clover; *Oenothera cuprea;* Halenias; Calceolarias; species of *Hypericum; Hydrocotyle* with prostrate, rooting stems; and several species of *Valeriana. Nertera* often forms close mats over shaded banks or mossy fallen logs. In dense tangles in drier parts of the meadows grow two ferns, *Pteridium* and *Dicranopteris*, the latter often scandent.

A very specialized flora reigns about the summits of the volcanoes, or at least about the limit of vegetation, which often is lower than the summit. On the summits of Irazú and Turrialba are extensive fields of volcanic rock, and lava flows often extend far down the slopes. In the mountains of Dota are wide expanses of natural meadow, covering high plains or gentle slopes, constituting the only paramos of North America, perhaps better called paramillos because of their meager extent. They are similar in every respect to the paramos of Colombia, Ecuador, and Peru, as indicated by the typically Andine plants growing in them.

Just below or at the edge of these alpine meadows or paramos are usually interlacing thickets of shrubs and low trees of localized species. Typical are *Escallonia, Ribes, Berberis, Mahonia, Hesperomeles, Holodiscus, Myrtus, Pernettia, Buddleia alpina, Arcytophyllum*, and a few Senecios. All or most of these are confined to such places. Most of the larger shrubs and small trees are densely invested with epiphytes, such as certain large bromeliads, mosses, and lichens, from which water is dripping constantly. Two conspicuous herbaceous plants of these places are *Myrrhidendron* and a giant *Rumex* sometimes four meters high or more, truly tree-like in habit, although its hollow stems are herbaceous and succulent.

The paramos of the mountains of Dota undoubtedly constitute one of the most interesting floristic regions of Costa Rica, if not the most interesting of all. They are best developed upon Chirripó, the highest peak of Costa Rica, Cerro de La Muerte, and the near-by Cerro de Las Vueltas.

Among their distinctive plants are several large mosses, which often carpet the ground to the exclusion of most other vegetation. There are extensive beds of *Sphagnum*, of several species, crowded into soft cushions saturated with water. Arising conspicuously from the sphagnum are several species of *Lycopodium*, stout, stocky, stiffly erect plants, often differentiated from their neighbors by a tinge of dark red. Here, too, are colonies of the narrow, stiff fronds of the Jamesonias, a genus of ferns restricted to the higher Andes, and in North America to these mountains.

Of small herbs, many of which form dense and elevated cushions, few of them with showy flowers, there are a great many, and since so many of these paramo plants are tiny, it seems likely that a great many of them are still to be collected. It must be remembered that the weather here is so uniformly disagreeable, with fogs, mists, and even drenching rains, and a cold wind blowing almost constantly, that only the most enthusiastic collector will linger long to hunt diminutive plants while his feet and knees are wet and sinking deeper every moment into the moss and ice-cold water.

*Lupinus* and *Castilleja* are two bright-flowered plants of the drier spots of the paramos and volcanic meadows. Other alpine plants are the almost minute *Gentiana sedifolia*, several species of *Carex*, *Juncus*, and *Luzula; Xyris; Eriocaulon* and *Paepalanthus;* a few low and some taller grasses; *Acaena cylindrostachya;* several species of *Alchemilla*, one of a definitely Andean type; Halenias; and *Eryngium*.

It is here in the paramos of Dota that the definitely Andean genus *Puya* (Bromeliaceae) finds its northermost outpost, isolated many hundreds of miles from its nearest occurrence in the mountains of Colombia. Except a few scattered shrubs and an occasional stunted tree, it is the tallest and stateliest paramo plant, its pole-like stems scattered through the meadows so as to resemble perplexingly the mullein stalks of some New England pasture.

Some of the best displays of certain of these paramo plants are near Santa María de Dota at a comparatively low elevation, probably not more than 2,400 meters, around small or large sphagnum bogs enclosed by dense but not very high forest. These bogs are gradually filling small ponds, and are not greatly unlike similar sphagnum bogs in the mountains of northwestern Montana. It is suspected that they represent remains of former more extensive paramos that have been gradually occupied by forest.

It gives one an uncanny feeling to push for an hour through the densest sort of wet oak forest, with the light so scant that a lantern

would be useful, then to emerge without warning upon one of these openings flooded with sunlight. The water is bordered with a broad belt of sphagnum, into which the feet sink so deeply that plants only a few feet from the bank, no matter how desirable, can not be reached. *Eriocaulon*, *Paepalanthus*, *Xyris*, and a low, shrubby *Hypericum* luxuriate in such situations, and it was in such a place that I first saw the Costa Rican *Puya*. The particular bog in which it grew, a rather large one, was bordered by a plant so strange that the spot seemed almost supernatural. Could an unsuspected cycad possibly occur at such an elevation? The trunks, three or four feet high and very thick, were surely cycad trunks, and the leaves, thick and hard to the touch, were surely those of a cycad. Very slowly it dawned that the plant was a fern, probably *Lomaria Wercklei* Christ, the only North American representative of another Andean group of plants.

## RELATIONSHIPS OF THE COSTA RICAN FLORA

In order to get some idea of the relationships of the Costa Rican flora with those of other regions it is necessary to consider the vegetation according to the belts discussed on preceding pages. A mere glance at the map affords no reason for supposing that the flora of Costa Rica should be particularly notable, or markedly different from that of other parts of Central America, at least Panama and Nicaragua or, more distantly, Guatemala. Yet the fact remains that after composition of the vegetation is studied, Costa Rica is found to have a flora which, taken as a whole, is distinctive, and quite dissimilar from that of other parts of Central America. The Volcano of Chiriquí in Panama is essentially Costa Rican in flora, but other regions of Panama are not.

Of all Central American countries Costa Rica possesses by far the richest flora. Nowhere is it even approached except in the Cobán district of Guatemala, which is limited in area as well as in number of species.

The variety of the Costa Rican flora is best illustrated in such groups as orchids, Piperaceae, and ferns, in all of which it is eminent. The percentage of endemism is extraordinarily high, nor is it believed that further exploration of adjoining countries will greatly reduce it. The reason for this is that the high mountains, where the greatest variety of plants exists, are isolated by either elevation or climate, or both, from all neighboring regions. The mountains of Nicaragua, to the north, are low and comparatively or absolutely dry. Those

of Panama, to the south, except the adjacent Volcano of Chiriquí, are too low to invite comparison. In order to find comparable areas it is necessary to look to such distant countries as Colombia and Ecuador, where, indeed, a similar flora exists. The montane flora of Costa Rica is definitely allied with that of Colombia and Ecuador, and shows little affinity with that of Guatemala, which is essentially Mexican.

The least peculiar region of Costa Rica is the tierra caliente, the majority of the species here having a relatively wide range. The rain forest of the Atlantic tierra caliente is in every respect similar to that prevailing from Panama to at least Guatemala, and probably even to the State of Veracruz in Mexico. Many of the trees have a still wider range, southward as far as the Amazon Basin. A good many endemic species of trees and shrubs are reported from the Atlantic tierra caliente, but these are to be expected in Panama and Nicaragua, or even in regions more remote. The herbaceous plants include a large number that are endemic so far as present knowledge indicates, but herbs are of relatively little significance in rain forest, and even the present endemics may appear in other countries.

The flora of the Pacific tierra caliente of Costa Rica is continuous with that occupying the Pacific coast from Sinaloa in Mexico south to Panama. Essentially the same flora reappears on the coast of Ecuador and, rather strangely, on the north coast of Colombia and Venezuela. It is characterized by a high number of Leguminosae, as usually is the case in tropical regions of limited or periodic rainfall. There are many apparently endemic Costa Rican species in this division, and probably many of them really are confined to the country, since endemism is not unusual in this coastal strip. But not a great deal is known about the Pacific coastal floras of Nicaragua and Panama, consequently many of these supposed endemics may later be discovered in those countries, if not even farther away.

The flora of the Costa Rican tierra templada is largely endemic. Its great variety of trees and shrubs is unequaled elsewhere except on Chiriquí. Many of them belong to South America genera, but one does not expect mountain species of trees and shrubs to continue over so wide a region as separates Costa Rica from the nearest similar regions, in Colombia. It is only the tierra templada plants growing about settlements or in places altered by man that have, as a rule, a wide range, extending in either direction, but more often toward the south. There are, I believe, a great many more species having in Costa Rica a northern than a southern limit.

Perhaps the most distinctive feature of the tierra templada flora is the abundance of oaks. Oaks are few in South America, and more numerous in Mexico than anywhere else in the world, but this does not imply any close relationship with the Mexican flora. More significant is the fact that pines fail to reach Costa Rica, but find their southern limit in central Nicaragua.

Mention should be made of the plants of grasslands, not only in the tierra templada but in the Pacific tierra caliente. Most savanna species have a wide range. Their affinities are obviously South American. North of Costa Rica are no savannas worthy of consideration, but farther south, near by in Panama and far away in Venezuela and the Guianas, are vast tracts of savanna land, of which the Costa Rican ones are distant outliers. The savanna flora of Costa Rica is essentially South American, not only in genera but often in the very species.

It is the flora of the tierra fría in Costa Rica that probably shows the highest percentage of endemism, and it certainly is the one most clearly South American in taxonomic affinities. This relationship is impressive in such groups as orchids, Melastomaceae, Rubiaceae, Gesneriaceae, the tribe Thibaudieae of the Ericaceae, Cunoniaceae, Araceae, Bromeliaceae, and many more that might be mentioned.

The closest link with the South American, or rather the Andean flora is exemplified in the vestigial paramos of southern Costa Rica, on the mountains of Dota. These represent a purely Andean type of vegetation, which vanishes even before the center of the country is reached.

## BOTANICAL EXPLORATION IN COSTA RICA

Of the Central American countries Costa Rica has received most attention from botanical collectors. This is the result of its fame for exuberant and varied vegetation, and also of its delightful climate and scenery, and the fact that in the uplands at least one is safe from malaria and other plagues that menace health in so many parts of Middle America.

Most other Central American countries were explored to some extent by Spanish botanists in colonial days or by other Europeans more than a century ago, but Costa Rica seems almost wholly to have escaped their attention. Plants were collected in Guatemala and Panama 150 years ago or more, but we find no mention of Costa Rican vegetation in the works of early writers, except for casual references in Oviedo's *History of the Indies* (1541).

The botanist who was privileged to reveal to science the first glimpse of the riches of the Costa Rican flora was a Dane, Anders Sandoe Oersted, who landed at Puntarenas in 1864. Fortunate indeed was the man who first with the critical eye of a botanist had the opportunity of exploring such a flora as this. Except for the common weeds of roadside and field, almost every plant he saw after reaching the uplands was new to science. By accident he landed at the strategic point for beginning his exploration, the point at which the least distinct flora was to be found. As he journeyed inland, up the Pacific slope, to the Meseta Central, and later the wet Atlantic slope, and the steep sides of the volcanoes, one climax after another was unfolded before him.

Oersted was an enthusiastic and capable botanist, who fully appreciated the opportunity offered him. From the coast he traveled slowly toward the interior, collecting at various stations along the way. Especially valuable were the collections made at the mines of Aguacate, a locality not revisited by later botanists, so far as I know. Reaching San José, he remained there some months, making excursions in different directions. He visited Pacaca and the valley of Jarís, then inhabited only by Indians. His pen has left a vivid picture of the forests of the mountains of Candelaria, that rise above San José, as they existed in his day. At present nothing remains of those forests where he collected so many of his species except a few scattered groves of scant extent, much of their remaining vegetation now damaged by pasturing cattle.

In Cartago Oersted passed several months. He made the acquaintance of Don Francisco María Oreamuno and Don Francisco Gutiérrez, who greatly faciliated his explorations. To the former he dedicated the genus *Oreamunoa* of the Juglandaceae, to the latter two beautiful plants of the Cartago region, *Lamourouxia Gutierrezii* and *Siphocampylus Gutierrezii*.

From Cartago Oersted must have made many excursions in search of new plants, but probably the regions accessible then were much less distant than those that now can be reached easily. It is probable that in the immediate vicinity of Cartago there was then a great deal more forest than exists today. He visited the slopes of Irazú that rise steeply above the town, and reached the summit. It was thus that so many of the high mountain plants of Costa Rica have their type localities on the slopes of Irazú.

Descending toward the coast, Oersted stopped at El Naranjo, now Juan Viñas, where he collected many more new plants, and also

at the settlement of Turrialba. Thence he made his way by most difficult trails down the Río Reventazón to Moin, and left the country by the Sarapiquí Valley. In Nicaragua he continued his botanical explorations, and also had an opportunity to visit Guanacaste in Costa Rica, where he made what were until recently the only collections known from the major part of that isolated province.

After three years in Central America, Oersted returned to Copenhagen, to devote the remaining twenty-five years of his life to study of his collections. Unfortunately he never completed a report upon his plants, although the herbarium shows that he named all or most of them, but he did publish many papers discussing the larger families, and describing many of the new species he had discovered. Groups that he treated in some detail included the palms, Lobeliaceae, Acanthaceae, Begoniaceae, Gesneriaceae, and Compositae.

Oersted's original specimens, preserved at Copenhagen, represent the cream of the endemic species of the Costa Rican mountains. Few of his specimens, apparently, were distributed to European herbaria, but in the United States a good many of his duplicates now are found in Field Museum of Natural History and the United States National Museum.

In 1848 Costa Rica was visited by a Polish gardener, Warscewicz, who had been a member of a Belgian commission sent to Central America with the idea of establishing a colony for settlement by Belgian emigrants. He visited several countries of Central America and northern South America, devoting much of his attention to orchids and hummingbirds. Little or nothing is known of his routes in Central America, for as a rule no locality data appear on his labels, and there is often doubt as to whether the species based upon his specimens were collected in Costa Rica or Panama, or even in Colombia or Ecuador. He did, however, gather original material of many Costa Rican orchids.

Later naturalists to explore the country were Moritz Wagner and Carl Scherzer, the latter commemorated in the handsome aroid, *Anthurium Scherzerianum*, now grown in hothouses all over the earth, but neither of these was a botanist. In 1853 or 1854 there came to Costa Rica a German, Carl Hoffmann, who spent the few remaining years of his life, until 1859, in study of the flora of his adopted land. He worked principally about the capital, and published accounts of his ascents of the volcanoes of Irazú and Barba. His collections are preserved at Berlin, where they have served as

basis for description of many of the most handsome ornamental plants of the mountains.

In 1856 and 1857 Hermann Wendland, gardener of the court of Hanover, visited Costa Rica and made a small but highly important collection of plants. He gave special attention to palms, orchids, and aroids, plants difficult to make into specimens, and consequently neglected by most collectors. He entered the country by the Sarapiquí Valley, and explored especially the mountain chain from Barba to Turrialba.

The German gardener Julián Carmiol, who died in San José in 1885, assembled a large number of the finer ornamental plants of Costa Rica in his garden. He was responsible for introducing to Europe many native species that are still favorites in cultivation.

Between 1870 and 1880 Costa Rica was visited by several European collectors, among them F. C. Lehmann, who seems to have made here only a small collection. He devoted many years to work in the mountains of Ecuador and western Colombia. Endres is best known for the orchids he discovered, and while nothing is available regarding his routes in Costa Rica, he must have found some of the best regions for these plants, because many species were described by Reichenbach from his collections. In the Natural History Museum of Vienna, where his specimens are deposited, there is also much material in other families, but little has ever been published concerning it. Otto Kuntze crossed the country from Limón to Puntarenas, collecting at various localities, especially in the Atlantic tierra caliente, and he mentions many of the plants in his account of his voyage around the earth.

In 1875 Dr. Helmut Polakowsky came to Costa Rica, in company with other teachers imported by the government to reorganize the secondary schools, and for two years he was instructor in natural history in the Instituto Nacional. He botanized particularly in the vicinity of Cartago and San José, and many of his specimens came from the Cerro de La Carpintera. He was author of several important papers upon the flora of Costa Rica, and described a number of new species. His specimens, at least in part, are in the Berlin herbarium.

Costa Rica has always been famous for its own distinguished men of letters and sciences, and it is not surprising to learn that the major part of its flora is the result of work by native botanists or others who adopted it as their home. Modern increase in knowledge of Costa Rican vegetation began with Professor Anastasio Alfaro, for many years Director of the National Museum of Costa Rica,

who in 1888 published a list of the known plants of the country, compiled from Hemsley's recently completed *Botany* of the *Biologia Centrali-Americana*. It is interesting to note that previous exploration had resulted in the report of 1,218 species of phanerogams and Pteridophyta from Costa Rica. Probably three-fourths of these were discovered by Oersted.

Professor Alfaro began, with the publication of this list, an interest in botany that has continued for many years. He has given most attention to orchids, ferns, mosses, and Cactaceae, in all of which he has made notable discoveries, in spite of the fact that his major work has been in other branches of natural history. His contributions to our present knowledge of the Costa Rican flora are very extensive indeed.

He was instrumental in arousing to interest in botanical collecting Juan J. Cooper of Cartago, already an enthusiastic naturalist, who made a large collection of specimens, mostly in the mountains south of Cartago. These were sent for study to Captain John Donnell Smith, who described from them a large number of new species.

Henry Pittier came to Costa Rica in 1887 from Switzerland, one of several Swiss educators invited to the country about this time to reorganize the educational system, He remained in Costa Rica until 1903, and during those years he and the several botanists or naturalists associated with him executed a systematic exploration which has not been equaled in any other country of tropical America. Pittier's interests were catholic, as indicated by the long list of his publications, covering almost every branch of natural history in its broadest sense, and other subjects as well, for Costa Rica and other regions of Central America and northern South America.

Henry Pittier undoubtedly has gained a more intimate knowledge of the natural history and especially the botany of Central America and northwestern South America than has ever been possessed by any single person. His many papers upon plants of Central America are fundamentally essential for any botanical work that ever may be undertaken there. The writer had the good fortune to be associated intimately with him for a number of years, and heard from his lips much about his work in Costa Rica. It was his sympathetic and fluent description that first gave the writer a desire to visit a country that seemed to possess such a distinctive charm, not only botanically but in many other respects.

The combined labors of Pittier and Adolfo Tonduz, Pablo Biolley, Carlos Wercklé, Alberto M. Brenes, and the Brade brothers

resulted in the formation in the National Museum in San José of a national herbarium which in 1903 was unequaled below the Río Grande del Norte. They visited almost every corner of the country, and while neither they nor many others could succeed in collecting all the plants of Costa Rica, they brought together a marvelous number of them, estimated by Pittier at 5,000 species. He began publication of the first comprehensive account of the Costa Rican flora, in the *Primitiae Costarricenses*, a work that most unfortunately was not brought to completion. In his account of the *Plantas Usuales de Costa Rica* he presented more information regarding Costa Rican vegetation than had ever been published before.

The herbarium so formed consisted of more than 18,000 numbers, which were sent to specialists of North America and Europe for determination. It may be seen from the data adduced that Pittier and his collaborators added to the known flora of Costa Rica almost 4,000 species! Besides the specimens filed in San José, many thousands of duplicates were distributed to the leading herbaria of the world. In all the larger herbaria of Europe and the United States there are so many of them that one marvels at the patient labor expended in their collection.

Adolfo Tonduz is well known to the botanical world for his collections of plants. He gave most of his life completely to them and spent more than 30 years in exploring the mountains and lowlands of Costa Rica. A man of somewhat eccentric nature, devoted to the flora of his adopted land, he built an enduring monument in the many Costa Rican plants that bear his name, and in his contributions toward advancement of botanical science. Carlos Werclé likewise was a man with rather eccentric traits—many botanists seem to be so—and at his unfortunate death he is believed to have possessed an unequaled store of information regarding the far corners of Costa Rica and their plant life. The writer had an opportunity of meeting him only once, and then but briefly, and was amazed at the fund of knowledge that he exhibited so fluently. Werclé collected less extensively than the other persons named but discriminately, giving his attention to special groups, particularly bromeliads and orchids. The majority of endemic bromeliads of Costa Rica were described from his collections. His specimens usually were disgraceful, for on his tramps over the country he used to cram any strange plants into his pockets or into a bag, and they reached the herbarium in a sad state, but still in good enough condition for study. After all, such a method of collection is not ill adapted to bromeliads. Werclé

published an important paper upon the phytogeography of Costa Rica, a work that is tantalizing because of its hints concerning rare plants that unfortunately still remain unknown to science, except as briefly mentioned by its author. His thorough knowledge of the country is well proved by this important paper, the only extensive one that he published.

Wercklé's later years were devoted to the collection of orchids, chiefly at the instigation of Doña Amparo de Zeledón, under whose patronage there were collected so many of the species figuring in Schlechter's classic account of Costa Rican orchids. Much of the material upon which Schlechter worked was gathered also by the Brade brothers, whose prime interest was in plants having horticultural value.

The work of United States botanists in Costa Rica began with Captain John Donnell Smith of Baltimore, Maryland, who, after a business career, retired about 1884 to devote the rest of his life to the botanical work in which he had long been interested. These years were equal to many a lifetime, for he lived until 1928, and lacked but a few months of attaining a full hundred years.

Captain Smith's attention probably was first drawn to Costa Rica by the collections of Juan J. Cooper, which were sent him for determination. In 1896 he visited the country, where he was accompanied on expeditions by Anastasio Alfaro. A charming gentleman, distinguished in appearance, highly cultured, with keen enthusiasm for his work, Captain Smith was a welcome visitor, and Professor Alfaro has spoken affectionately of his companionship upon their excursions. I have also heard Captain Smith recall with evident pleasure his memories of the Costa Rican mountains, where he saw so many plants that previously he had known only from mere dried specimens. Among the regions that he visited were the plains of Santa Clara, La Palma de San José, and the mountains south of Cartago.

For many years Captain Smith was the authority upon the flora of Central America. He financed collectors in several countries, and received large collections for study. He assembled a very extensive herbarium, chiefly of Central American plants, with hundreds of types of species he had described. These, with his large library, are now in the United States National Museum in Washington.

Reports upon Costa Rica by enthusiastic visitors have caused several United States botanists and collectors to travel to Costa Rica, where they have obtained large series of new and valuable

material. Among them have been Dr. William R. Maxon of the United States National Museum, who has visited Costa Rica twice, in search primarily of ferns. Dr. O. F. Cook and C. B. Doyle of the United States Department of Agriculture made a substantial collection in different parts of the country, including many specimens of palms. Dr. J. M. Greenman of the Missouri Botanical Garden collected in the Costa Rican mountains, where he was especially interested in the genus *Senecio*. Prof. H. E. Stork of Carleton College, Minnesota, has made two admirable collections, largely in the region of Dota. Dr. C. W. Dodge of the Missouri Botanical Garden has visited Costa Rica twice, in search of cryptogamic plants, particularly lichens. There are also a number of other visitors from the United States who have made collections in Costa Rica.

A few years ago the well known mycologist, H. Sydow of Berlin, made an extensive collection of Costa Rican parasitic fungi about which he has issued various publications. Additional material has been collected for him by Professor Brenes. Specimens of some of the host plants are deposited in the Berlin herbarium, and others have been sent to the writer for determination.

Of special importance because of the publications based upon them are the collections made recently by the Austrian expedition under Dr. Porsch. Most of the botanical material was collected by Dr. Giorgi Cufodontis, who has published an admirable list of the plants collected, with critical notes and descriptions of new species.

Among the residents in the country who have made important contributions to knowledge of its flora is Mr. C. H. Lankester of Las Cóncavas. With wide interests in natural history, he has made intensive studies of the birds and butterflies. In botany his special field of interest has been the orchids, which he has hunted assiduously in the mountains and lowlands. With facilities for care of living plants, he has brought them into flower, and the specimens he has sent to the Kew Gardens and to the United States have served as types for dozens of new species. To most of the foreign botanists visiting Costa Rica in recent years Mr. Lankester has been a genial host and a tireless guide.

Of the Costa Ricans who have given serious attention to the flora of their native land one is preeminent for his work. Professor Alberto M. Brenes, botanist of the National Museum for many years, took up the work of exploration after Pittier left the country. With unequaled zeal and devotion he has continued his collections to the present time, and has accumulated a herbarium of more than

20,000 numbers. In volume and value of his collections, he has no rival in Central America. In fact, it is questionable whether they have been surpassed even in South America, unless by such botanists as Spruce, Glaziou, and Ducke in Brazil.

The writer is extremely fortunate in being able to include in this flora the unique collection made by Professor Brenes. Although representing several distinct regions, it comes in chief part from the mountains of San Ramón, a center of inexhaustible botanical variety. It well illustrates the floristic wealth of a region of the Costa Rican mountains. No such intensive study has been given to any part of Central America, and the San Ramón region is now better known in herbaria than any other area of equal extent in Middle America, unless it be the Panama Canal Zone, or Morelia, Mexico. How fortunate botanical science would be if only there were more collectors of equal industry and discrimination!

Other Costa Ricans besides those already mentioned have been active in expanding the available knowledge regarding the flora. For many years Otón Jiménez has worked both directly and indirectly to explore the forests, and it is much to be regretted that the demands of business affairs have precluded a greater amount of personal field work on the part of one who has such a keen perception of facts and the ability to discover them in strange places. As it is, he has acquired a vast amount of interesting data concerning Costa Rican plants, which it is hoped may be made available to the public. Many of his specimens are found in the United States National Museum.

Professor Rubén Torres Rojas of Cartago in recent years has made extensive collections, especially of ferns, in the varied region of Cartago. In the Herbarium of Field Museum there is an extensive series of specimens of his collection that has proved unusually valuable because of the numerous vernacular names that accompany it. Some of his earlier collections are in the United States National Museum.

The first collection made in the Tilarán Mountains, so far as I know, was one by Prof. Juvenal Valerio Rodríguez, now Director of the Museo Nacional. This material, from El Silencio de Tilarán, was fascinating because of the curious flora that it indicated, and aroused in the writer a desire, later gratified, to visit the mountains of Guanacaste. Mention should be made of Prof. Rómulo Aguilar and the late Prof. Fidel Tristán, the latter a congenial companion and a wise guide to many foreign naturalists who visited Costa Rica.

Prof. Manuel Valerio has forwarded to the writer more than a thousand numbers of plants from the most varied regions, some of the species new to the country and others new to science. He has also made extensive collections of mosses that have added many species to the known Costa Rican flora.

Very recently there have been received excellent and sometimes extensive collections made by promising new collectors resident in Costa Rica. Among them are Fernando Solís Rojas and Professor Manuel Quirós Calvo, and it is greatly hoped that the number of Costa Rican botanists may increase. There is no good reason why floras of Central American countries should not be written by the resident botanists who have a deeper understanding of their native lands. Only when this is done shall we ever have a fully satisfactory knowledge of the plant life of Middle America. The foreign botanist, no matter how sympathetic his attitude toward a strange country nor how well he may explore it, misses so much of the local atmosphere and overlooks data that are common knowledge among the whole population. No matter how widely he may travel, he can never gain the intimate geographic and floristic knowledge that a person born in the country could acquire.

It is unfortunately true that local floras published in Latin America by resident scientists often have been superficial or worse, but that is equally true of many published in Europe and the United States. Every Central American country should and could possess a botanical library adequate for study of its flora, and a comprehensive herbarium, formed by local collectors. Such a herbarium now exists in Costa Rica. By sending the local collections to specialists in countries where facilities exist for their study, there can be assembled an authoritatively determined series of any country's flora, and with this as a basis, assisted by the proper literature, in which any Latin American institution can easily obtain aid from North American botanical libraries, the local botanists could begin original creative work that would form a basic contribution of the highest practical value to science.

The writer's personal experience in Costa Rica has consisted of two visits to the country, in the winters of 1923–24 and 1925–26. While the time spent there was sadly limited, special facilities graciously provided by friends in Costa Rica made it possible to visit a surprising number of localities, and obtain a large quantity of diversified herbarium material. Without such exceptionally generous assistance the work would have been far less successful.

During the first season attention was centered upon the central region, with many short trips about San José and Cartago. Longer excursions were made to La Palma and La Hondura, on the old road to the Atlantic coast; Las Nubes, high on the slopes of Irazú; El Coyolar and the Río Grande de Tárcoles, near the Pacific coast; the regions of Navarro, La Estrella, and Orosi south of Cartago; and the Cerro de La Carpintera, near Cartago. A memorable excursion was made to Alajuela, and an ascent to the summit of the Volcano of Poás, with its forest-walled lake and its awe-inspiring crater. Another had as its object the Volcano of Turrialba, as far as the famous finca situated well toward its summit. Very profitable visits were made to several parts of the Atlantic coast, especially La Colombiana and Guápiles, regions that have received little attention from collectors.

During the second visit to Costa Rica more distant regions were visited, although collections were made at some of the places explored during the preceding years, such as La Palma and La Hondura, Cartago, Navarro, and La Carpintera. Almost a month was spent in work about Santa María de Dota, an area little explored previously. After the Dota expedition a month was devoted to Guanacaste, where, from headquarters at Tilarán, daily excursions were made in every direction. Our trips extended as far as the Lake of Arenal, on the Atlantic side of the Sierra de Tilarán.

Several excursions of a day each were made to the upper slopes of the Volcán de Barba, a volcano which, in spite of its accessibility, has attracted few collectors. An excursion to Fraijanes, on the slopes of Poás, was especially noteworthy for the new plants it revealed. At Pejivalle a rich collection was made of the plants of the border line between the tierra templada and the tierra caliente. Two days were passed in collecting in the rain forest along the banks of the Reventazón near El Cairo.

During these two expeditions to Costa Rica approximately 15,000 numbers of plants were obtained, representing all groups, with special emphasis upon orchids. Although the field covered was rather wide, and a good deal of effort expended to utilize it, it is realized that only a small part of Costa Rica was seen. Travel to the farther parts of the country, or even to some of those quite near the capital, as a bird flies, is so tedious that many months and years of time and effort are necessary if one will see most of Costa Rica.

As the map is studied, with a knowledge of the localities at which plants have been collected, it is plain that most of Costa Rica never

has been visited by a botanist, except most casually. Whole regions are botanically unknown, and until every mountain side has been explored, every region of the plains visited repeatedly, there can be no certainty that the flora is even approximately well known. Some places have had more than their share of exploration, the environs of San José and Cartago, and the southward slopes of Irazú, the volcano slopes most visited by a long line of botanists, and apparently the least interesting ones of the country. The region of San Ramón has been combed assiduously, to reveal an unparalleled flora. But even in the outskirts of San José the writer has found undescribed species, and many others doubtless can be found in even the best explored localities.

Regions conspicuously in need of exploration are so numerous that it is impractical to list them. Most alluring of all, perhaps, are the forests of El General and the slopes of Chirripó and the other high mountains of the Cordillera of Dota. Scarcely less promising are the volcanoes of Guanacaste, whose very summits have scarcely been seen even from afar by a botanist. There is no reason to suppose they are less interesting than the central volcanoes, and what sort of a flora they possess is a matter for speculation. Close as they are to the Meseta Central, the northward slopes of the central volcanoes are wholly unknown, nor are they easy to reach. The savannas and plains of the southeastern part of Costa Rica are almost virgin territory.

One of the most promising fields awaiting botanical collectors is the wide plains of San Carlos. Practically nothing is known of the whole region toward the Río San Juan, and not a great deal about the rest of the Atlantic plains.

Most of the unexplored regions mentioned are fairly easy of access, so far as human transportation is concerned. I have often envied ornithological collectors, who carry in saddle-bags all the necessary equipment for collecting birds, and transport their finished collections with ease. Unfortunately a botanical collector needs bulky and heavy equipment, and the finished specimens are even more bulky, making transportation a serious problem. A botanist can easily visit the most remote and desirable parts of Costa Rica, but without almost unlimited funds for hire and care of pack animals, he can not make collections there, and even with such funds, pack animals can not always be obtained. It is on this account that for many decades to come Costa Rica will continue to attract botanists, for they will be able only to nibble from year to year at regions that

become gradually more accessible. Even progressive accessibility can not be depended upon, for many regions of the tropics, including some in Central America, are far less accessible now than they were decades or even centuries ago.

## PLAN OF THE FLORA

On the following pages is presented a systematic, annotated list of the phanerogamic plants of Costa Rica. In ferns the country is one of the richest areas of the earth, and it is unfortunate that they can not be listed here, especially since their literature is even more widely scattered, perhaps, than that of the flowering plants. There have been published extensive lists of the mosses, hepatics, and lichens, but all these, like the fungi, are still known but imperfectly, the mosses and lichens being better known than the other groups.

In most details the plan of the following list is obvious. For each family there have been cited all Costa Rican species known to the writer, with indication of their distribution within and outside the country. For names based on Costa Rican material there is cited the place of publication, and for such species there are cited also their synonyms with place of publication. The first citation of material for a species published from Costa Rica is the type collection, with the locality and the name of its collector. Type collections of synonyms are cited in parentheses after the citation of the synonym. Species without citation of literature were described from other countries. The species believed to be endemic, that is, confined to Costa Rica, are so indicated (when only a single collection is known, this has not seemed necessary), but some of these doubtless will be found later in other countries.

Cultivated plants are included in the list, so far as they are known. For some obscure reason, cultivated species are despised by the average systematic botanist as being something unworthy of his attention, with the natural result that common garden plants are less well known, as regards nomenclature and taxonomy, than our native flora. While horticultural plants do not constitute a part of the native flora of a region, from a practical standpoint and as a matter of interest to residents and visitors, they are often more important than the native ones. It is regretted only that the list of cultivated plants of Costa Rica can not be presented more completely than it appears on the following pages.

In the present flora are listed all the species known or reported for Cocos Island, so far as they are familiar to the author.

Unfortunately, but little is known of its flora which, from general reports, must be a rather rich one. Although lying far from Costa Rica, Cocos Island is a possession of that republic and, somewhat strangely, the Cocos Island flora seems to be as closely related to that of Costa Rica as to that of any other continental region.

At this place it may be worth while to insert a word of caution regarding Costa Rican place names. The names of saints, particularly, are all too lavishly employed to designate geographic localities in Central America, and within a given country, often indeed within the same province or department, the same saint's name may designate two or more settlements. Locally the places usually are distinguished by the addition of a reference to the province or to some near-by locality, as San Isidro de Coronado and San Isidro de Heredia. Frequently the distinguishing phrases do not appear upon collectors' labels, sometimes leading to the assumption that two plant localities are identical when in fact they may be many miles apart, in quite unlike phytogeographic regions. Especially to be noted in Costa Rica is the name La Palma. La Palma de San José in the Department of San José has long been a favorite collecting ground for local and visiting botanists, and is the type locality for many species. Almost equally famous for orchids, however, is another place of the same name, La Palma de San Ramón, at which Professor Brenes and others have found so many new species. Upon the following pages these and other similarly duplicated names have not always been distinguished.

## ACKNOWLEDGMENTS

Were it possible to name here all persons who have given material assistance to the writer in the course of work with the plants of Costa Rica, the list would be a very long one, of many dozens of names. The preparation of a local flora well illustrates the necessity of cooperation by many people to achieve a definite and visible end. How many collectors, how many students in both field and herbarium, working together or separately for almost a century, have collaborated to make possible the presentation of facts that appears on the following pages! Unfortunately it is practical to mention only a few of the persons to whom the writer is indebted, but these few are important.

With his wonted hospitality toward visiting scientists, Professor Anastasio Alfaro, then Director of the Museo Nacional, generously provided convenient working quarters in the museum building during all the time the writer spent in Costa Rica. These were more than

ample, and an extremely pleasant place in which to be, even during the earthquake weeks of March, 1924! Professor Alfaro contributed freely of his time to the success of the work, and gave helpful advice as to its execution, besides collecting a large quantity of highly desirable specimens. He was a congenial guide upon a delightful excursion to the Volcano of Poás, of which the most interesting and vivid memories are preserved by the writer. With his simplicity, gentleness, and abundant store of accurate knowledge, Professor Alfaro represents the best type of scientist, a man whom I shall always remember with deepest affection.

On both his visits to Costa Rica very direct assistance of the most substantial kind was given the author by Don Otón Jiménez Luthmer of San José, who is the good counselor of North American botanists. His advice upon practical matters of procedure as well as upon regions best suited for exploration has been invaluable. The writer looks back with longing to the many pleasant evenings spent in his company, when the work of the past and future was discussed so sympathetically. Even more to be remembered are rides with him to the mountains, and it was, in fact, in his company that I made an excursion to La Palma, where I saw for the first time the wonderful diversity of the flora of the tierra fría. No petty detail of the writer's work was too small for his consideration; without his unstinted kindness the writer's memories of Costa Rica would be less perfect. His sympathetic and witty exposition of the history and culture of Costa Rica have contributed more than the reading of many books to an understanding of the principles that distinguish this country among all lands of tropical America.

To Mr. C. H. Lankester of Las Cóncavas the writer owes many favors and many of the brightest pictures in his gallery of Costa Rican recollections. One who has experienced the hospitality of Mr. and Mrs. Lankester at Las Cóncavas has something to remember. Nor does their hospitality end there. The writer has not forgotten that they sent a special messenger upon a two days' journey to bring a greeting at Christmas time. Such courtesies are not forgotten.

To Mr. Ferdinand Nevermann there are special obligations for a most pleasant and profitable visit to his fincas in the lowlands along the Reventazón River. Enviable is the botanist who receives a welcome from so considerate a host, or visits the forest with so competent a guide.

Another who will ever have a special place in the writer's affections is Professor Rubén Torres Rojas of Cartago, to whom he is indebted

for some of the happiest days of all his many memorable ones in Central America. I have been fortunate in having his company upon several important excursions to Navarro, to the upper slopes of Turrialba, to Orosi, and to the beautiful region of Fraijanes on the slopes of Poás. His gentleness and consideration, his inflexible punctuality, and his joyous enthusiasm will ever be remembered with pleasure.

I have left until the last one person to whom I am most indebted for practical help and companionship through many days of work in the mountains and lowlands of Costa Rica—Professor Juvenal Valerio Rodríguez, Director of the Museo Nacional of Costa Rica. During my first visit to Costa Rica we made but one excursion together, to La Hondura de San José. During the second expedition I was more fortunate. Professor Valerio accompanied me during part of the time spent in Santa María de Dota, and together we made two ascents to the paramos of Cerro de Las Vueltas, spending there the unforgettable New Year's Eve of 1926. For a month we were together in Guanacaste, a province that without his aid I should scarcely have seen. The great success of that expedition and the warm welcome received in Guanacaste were due solely to his foresight and to the high esteem in which he is held in that alluring region. Later we visited the lowlands of Pejivalle and El Cairo, and made several memorable ascents of the slopes of the Volcán de Barba, setting out from Heredia in the *madrugada* or earlier, so that we saw the awesome spectacle of the sun's slow illumination of the Meseta Central, with a final blaze of light and color that no painter's brush could exaggerate. The whole day would be spent in the forests and meadows high on Barba's slopes, and riding homeward after dark we would see the less spectacular but very peaceful and comforting view of the Meseta Central, dotted with myriad clusters of electric lights, each locating a city or a tiny village.

All these many days of excursions were very profitable ones, all took us to fascinating places where there was much beauty and entertainment. Sometimes there was aching weariness when the day was over, because of the great amount of work that had to be done. Such an opportunity and necessity for work seldom comes to a botanist. Throughout these weeks Professor Valerio was always the most kind and entertaining companion, conversing eloquently upon interesting subjects pertaining to science and many other fields of knowledge. He was a tireless worker, always patient and considerate, even when he had frequent reason for provocation to

quite other moods. His kindness and friendship will always be treasured by one who often has sorely tried both.

There are many other Costa Ricans who deserve mention here, rich and poor, who extended the hospitality of their homes to shelter a guest who was undoubtedly a pest—this is a presumption; there never was any visible sign—with his peculiarities. There were also many others who were generous in providing information of the most varied sorts, upon voyages or while collecting material in the field. Everyone seemed to have a genuine and intelligent interest in the work being done, and a desire to be of service, if even in the most modest way. I can not remember ever to have met with discourtesy from any Costa Rican. If the eyes of any of these persons should ever light on these pages, let them feel that their sympathy has helped to give the foreign world an idea of the flora of their country, and let them know that wherever in the world there is a person who knows something about Costa Rica, their country has a friend.

While it is impossible to mention all the people who gave direct assistance to the writer's exploration in Costa Rica, there must be mentioned a few others who aided in other ways than the making of collections. From Don Próspero Mena of Santa María de Dota many favors were received. To Doña Isabel Valverde of Santa María and her family the writer is indebted for the most homelike life, at least of the longest duration, that he has ever enjoyed in Central America. And especially remembered are the evenings spent in Tilarán with Don Federico Carmiol and Don Daniel Esquivel, whose geniality had an important part in the success of our work in Guanacaste, and in the pleasant recollections that are retained of it.

To Professor Oakes Ames of Harvard University the writer is indebted for the long list of Costa Rican orchids that appears on the following pages, and also for substantial aid in the success of the two expeditions to Costa Rica. To Dr. William R. Maxon of the United States National Museum special thanks are given for the loan of a large amount of material studied in preparation of the *Flora*. Last, but not least, special acknowledgment should be made of the many favors received from the United Fruit Company, which has so often aided the writer's work in Central America. That company's customarily generous assistance toward scientific work contributed greatly toward the success of the two visits to Costa Rica. Its employees in the Atlantic lowlands were courteous in affording facilities for work in the tierra caliente, and to some of them, par-

ticularly Dr. Paul V. Siggers, then of La Colombiana, the writer is indebted for many profitable and pleasant days spent in the luxuriant forests that border the great banana plantations.

## BIBLIOGRAPHY

The publications cited below are those most important or useful for study of the Costa Rican flora. The list is brief, but if there were included all papers containing references to Costa Rican plants, it would fill many pages. A more complete bibliography may be found in Pittier's *Plantas Usuales*. Unfortunately, the works practically useful for study of Central American plants, at least for nonprofessional botanists, are few. Those that treat isolated groups or contain descriptions of new species are scattered through serials and other volumes, many of which are available in only the larger libraries. In the systematic list forming the principal part of this volume there will be found references to monographs of families and genera that are useful in study of the Costa Rican species concerned.

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**Calvert, Amelia Smith,** and **Calvert, Philip Powell.** A year of Costa Rican natural history. 577 pages, numerous plates, map. The Macmillan Company, New York, 1917. A good description of Costa Rica, with extensive notes regarding both animals and plants.

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**Durand, Th.,** and **Pittier, H.** Primitiae florae costaricensis. 2 vols., Brussels and San José, 1891–1901. The only proper flora ever published for Costa Rica and very useful, but unfortunately it does not cover all the families.

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**Pittier, Henri.** Ensayo sobre las plantas usuales de Costa Rica. 176 pages, 31 plates. Washington, 1908. The most useful published paper for gaining a general idea of Costa Rican vegetation, and equally useful for almost all other parts of Central America.

**Record, Samuel J.,** and **Mell, Clayton D.** Timbers of tropical America. 610 pages, frontispiece, 50 plates. New Haven, 1924. A descriptive account of the principal woods of tropical America, with much information regarding trees of Central America and their economic uses.

**Standley, Paul C.** Trees and shrubs of Mexico. Contr. U. S. Nat. Herb., vol. 23. 1,721 pages. Washington, 1920–26. Contains descriptions of many Costa Rican species.

**Standley, Paul C.** Flora of the Panama Canal Zone. Contr. U. S. Nat. Herb., vol. 27. 416 pages, 51 plates. Washington, 1928. Useful for the coast regions of Costa Rica.

——— Flora of the Lancetilla Valley, Honduras. Field Mus. Nat. Hist., Bot. Ser., vol. 10. 418 pages, 68 plates. Chicago, 1931. Contains descriptions and illustrations of many Costa Rican plants.

——— and **Calderón, Salvador.** Lista preliminar de las plantas de El Salvador. 274 pages. San Salvador, 1925. Includes notes and lists of vernacular names that are somewhat useful also in Costa Rica.

**Wercklé, Carlos.** La subregión fitogeográfica costarricense. 55 pages. San José, 1909. An excellent account of the phytogeography of Costa Rica, by one who knew it well. It is unfortunate that one who knew so much of the plants of Costa Rica, through many years of keen observation, should have published so little.

## SYSTEMATIC LIST OF FAMILIES, GENERA, AND SPECIES

### CYCADACEAE. Cycad Family

One of the most ancient groups of higher plants, represented in the native flora of Central America only by the genus *Zamia*.

### CYCAS L.

**Cycas revoluta** Thunb. Cultivated at Desamparados, and doubtless in other regions. Native of the East Indies. A handsome, palm-like plant with a short, thick trunk, the very stiff leaves with very numerous narrowly linear leaflets.

### ZAMIA L.

**Zamia Skinneri** Warscewicz. Wet forests of the Atlantic coast, ascending to Pejivalle (900 meters), and in the mountains of Guanacaste (up to 700 meters); abundant in many places. Also in Panama. A large plant of palm-like appearance, the thick, rough trunk as much as a meter high, or the leaves often rising directly from the ground; leaves pinnate, the segments few or numerous, rigid, lanceolate, with conspicuous, elevated nerves; fruit cone-like, the scales covered with a brown or rusty wool. A very handsome plant, which has been introduced to the greenhouses of Europe. Specimens of *Zamia* from Costa Rica have been referred to *Z. pseudoparasitica* Yates, which is doubtfully distinct from *Z. Skinneri*.

In the coast of Honduras there is a species of this group (*Z. furfuracea* L. f.), which is known by the name Camotillo. Its root is highly poisonous, and has been employed at times for criminal poisoning, as well as for poisoning noxious animals. There is a popular belief that the root, if out of the ground two days, kills its human victim in two days; if dug a week before, it kills in a week, and so on. I do not know whether the Costa Rican species is

used in the same manner, or whether the same belief is held there regarding it. It goes without saying that, although the root is a dangerous poison, it does not kill in accordance with the popular schedule.

## TAXACEAE. Yew Family

Reference: R. Pilger, Pflanzenreich IV. 5. 1903.

### PODOCARPUS L'Hér.

A genus of wide dispersal in tropical regions of almost the whole earth. Besides the species enumerated here, another Central American one grows in Guatemala and British Honduras. The wood is yellowish or brownish, of fine and uniform texture, and easy to work. In the regions where it is found it is employed for the same purposes as pine (*Pinus*). Pittier states that in Costa Rica it is favored for the manufacture of certain parts of ox carts.

**Podocarpus montanus** (Willd.) Lodd. *Ciprecillo, Cobola.* Volcán de Poás; mountains of the Cantón de Dota; at 2,000–3,000 meters. A South American species that does not extend north of Costa Rica. A tall tree, 25 meters high or more; leaves 1–2 cm. long, linear, white on the lower surface; fruit juicy, purplish black, with a single seed. The branches look almost exactly like those of fir (*Abies*), and I well remember the first time that I ever saw some of them, at the Lechería on Volcán de Poás thrown on the ground where they had been used as the basis for a bed, just as fir branches are sometimes used in the United States. I could not believe that they were not fir branches, but at the same time could not guess how they might have reached Costa Rica! The tree is plentiful on the slopes of Poás from the Lechería to the crater.

**Podocarpus oleifolius** Don. *Ciprecillo, Cobola.* Wet forest of Volcán de Poás and mountains of the Cantón de Dota; El Muñeco, Prov. Cartago; region of San Ramón; at 1,400–2,700 meters. A South American species that does not extend north of Costa Rica. A tall tree, up to 20 meters or more in height; leaves linear-lanceolate, 3–8 cm. long, about 1 cm. wide, green. All parts of the plant exhale an unpleasant odor. The trees are abundant in the mountains, especially in Dota, but are so tall that a person on foot ordinarily sees nothing of their foliage, except the young seedlings, and is unaware of the adult trees.

Pilger reports for Costa Rica (Poás) *P. macrostachyus* Parl., another South American species. The specimens I have seen were

all sterile, and it has been impossible to recognize more than a single species, because the differences are based upon the inflorescences. However, I consider it highly improbable that there exist on Poás two (this and *P. oleifolius*) closely related species of the genus. Consequently, it seems more nearly in accordance with the probable facts to refer all the specimens with broad leaves to a single species.

## CONIFERAE. Pine Family

### ARAUCARIA Juss.

Several species of this genus are rather frequent or common as ornamental trees in Central America, often attaining a great size. They are natives of South America, Australasia, and the Pacific islands.

**Araucaria excelsa** R. Br. Planted frequently in the temperate region. Native of Norfolk Island. A handsome tree, at first pyramidal in form, with horizontal or drooping branches, the rigid, linear leaves somewhat curved, not closely imbricated. Doubtless other species are planted in Costa Rica, especially *A. Rulei* Muell., with appressed, densely imbricated leaves.

### CRYPTOMERIA D. Don

**Cryptomeria japonica** D. Don. Planted as an ornamental tree in the temperate region. Native of Japan and China. A tall tree with reddish brown bark peeling off in shreds; leaves linear-subulate, laterally compressed, somewhat incurved, 6–8 mm. long.

### CUPRESSUS L. Cypress

**Cupressus Benthamii** Endl. *Ciprés.* Cultivated commonly in the Meseta Central and elsewhere as an ornamental tree. Native of the mountains of Guatemala and Mexico. The species has been reported for Costa Rica as *Juniperus flaccida* Schlecht. The branches are employed commonly as decorations in churches and houses.

### PINUS L. Pine

In spite of the fact that ill-informed writers, with little regard for accuracy, have reported the existence in Costa Rica of pine forests, these exist only in their imagination, for pines in a wild state do not exist in the country. The genus has its southern limit in America in central or northern Nicaragua.

**Pinus oocarpa** Schiede. *Pino.* Planted occasionally in small numbers as an ornamental tree in the region of San José, and espe-

cially about fincas on the middle slopes of the mountains. Ranging from Mexico to Honduras and probably to Nicaragua.

### THUJA L.

**Thuja orientalis** L. A shrub or small tree, native of eastern Asia, sometimes planted for ornament in parks and fincas in Costa Rica. In general appearance it suggests *Cupressus*, but is distinguished by its evidently compressed branchlets.

## TYPHACEAE. Cat-tail Family

### TYPHA L. Cat-tail

**Typha angustifolia** L. *Espadaña, Tule balsa. T. domingensis* Pers. A plant of open swamps, forming wide colonies in some parts of the Atlantic coast, and probably in other regions of the country. Widely distributed in both hemispheres. In other parts of Central America the plant is called Tule and Enea. It is a coarse herb, 1–2 meters high, with spongy, flat, long, linear leaves; the inflorescence is a thick, chestnut-colored spike 10–40 cm. long. In some parts of the Central American coast the fluffy "wool" from the spikes is utilized for stuffing pillows and cushions.

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In gardens there are cultivated sometimes as ornamental plants species of *Pandanus* (*P. tectorius* Soland. and *P. dubius* Spreng.; Pandanaceae). They are tall plants, somewhat palm-like in habit, the narrow leaves sword-shaped, their margins armed with fine, spine-like teeth. They are natives of the East Indies.

## POTAMOGETONACEAE. Pondweed Family

### POTAMOGETON L. Pondweed

**Potamogeton foliosus** Raf. Meseta Central and probably in other regions. A species widely distributed in America. An aquatic plant with long, slender stems, floating in water, the leaves linear, the minute flowers green, in small spikes. The species of *Potamogeton* grow in lakes or streams, attached to soil or stones, with their leaves all submerged or some of them floating on the surface of the water. It is probable that other species grow in Costa Rica, although these plants are not plentiful in the tropics.

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It is probable that the genus *Naias* (Naiadaceae) is represented in Costa Rica. Two or more species occur elsewhere in Central America.

## ALISMACEAE. Arrowhead Family

### ECHINODORUS L. Rich.

**Echinodorus tenellus** (Mart.) Buchenau. Open swamps in the coasts or in regions of scant elevation. Widely distributed in America. A small herb, the leaves linear to elliptic; flowers small, white; fruit a small head of minute achenes. Undoubtedly other species of *Echinodorus* are to be found along the Atlantic coast.

### SAGITTARIA L.

**Sagittaria lancifolia** L. Atlantic coast to the Meseta Central; Guanacaste; in swamps or in the edges of streams and lakes. Widely dispersed in tropical America. An aquatic plant, the leaves lance-linear to elliptic, 20–50 cm. long; flowers large, white, in long racemes; fruit a head of many achenes.

**Sagittaria latifolia** Willd. Swampy places in the coasts, usually growing in shallow water. Widely distributed in America. Leaves arrow-shaped.

## BUTOMACEAE

### HYDROCLEIS L. Rich.

**Hydrocleis parviflora** Seub. Collected in Guanacaste by Oersted. An aquatic plant, otherwise South American in distribution, unknown elsewhere in Central America.

There is to be found almost certainly in Costa Rica, at least on the Pacific slope, *Limnocharis flava* (L.) Buchenau, another aquatic plant of this family. It is known from both Nicaragua and Panama.

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Also to be expected in Costa Rica are species of *Triuris* and *Sciaphila*, of the family Triuridaceae. They are delicate saprophytes of dense, wet forests of the tierra caliente. Species of *Sciaphila* are known from Honduras and Panama.

## GRAMINEAE. Grass Family

Reference: A. S. Hitchcock, The grasses of Central America, Contr. U. S. Nat. Herb. 24: 557–762. 1930.

One of the largest families of plants, and the one containing the plants of greatest importance to man. Grasses are most abundant in temperate regions, but they are well represented in Costa Rica.

### AEGOPOGON Humb. & Bonpl.

**Aegopogon cenchroides** HBK. Meseta Central. Mexico to Bolivia.

**Aegopogon tenellus** (Cav.) Trin. Meseta Central, and probably in other regions. Arizona to northern South America.

## AGROSTIS L.

**Agrostis bacillata** Hack. Oesterr. Bot. Zeitschr. 52: 59. 1902. Type from Cerro de La Muerte, 3,100 meters; paramos of that peak, and of Cerro de Las Vueltas. Endemic.

**Agrostis Hoffmanni** Mez, Repert. Sp. Nov. 18: 3. 1922. Irazú, *Hoffmann;* also Cerro de La Muerte, 3,100 meters. Guatemala to Chile.

**Agrostis Pittieri** Hack. Oesterr. Bot. Zeitschr. 52: 60. 1902. Known only from Volcán de Poás, 2,500 meters, growing in sphagnum bogs. Endemic.

**Agrostis stolonifera** L. Abundant in meadows of the volcanoes, where it has been sown for pasture. Imported from Europe.

**Agrostis tolucensis** HBK. Paramos of the high peaks, 2,700–3,100 meters. Mexico to Chile.

**Agrostis turrialbae** Mez, Repert. Sp. Nov. 18: 4. 1922. Volcán de Turrialba, *Pittier*. Turrialba and Cerro de Las Vueltas, in pastures and paramos, 2,000–2,600 meters. Endemic.

## ANDROPOGON L.

**Andropogon bicornis** L. *Cola de venado*. Meseta Central, and regions of less elevation, growing in savannas and abandoned fields; region of San Ramón. Widely distributed in America.

**Andropogon brevifolius** Swartz. Meseta Central and regions of less elevation, in pastures and on open banks; region of San Ramón. Tropical regions of both hemispheres.

**Andropogon condensatus** HBK. Meseta Central to the coasts. Mexico and Lesser Antilles to Argentina.

**Andropogon glomeratus** (Walt.) BSP. A common grass of the Meseta Central, and in regions of less elevation. Southeastern United States to Argentina.

**Andropogon hirtiflorus** (Nees) Kunth. Cantón de Dota; Meseta Central, extending to the coasts. Widely distributed in America.

**Andropogon leucostachyus** HBK. Meseta Central, extending to the coasts. Widely distributed in America.

**Andropogon semiberbis** (Nees) Kunth. Meseta Central, and in the tierra caliente. Florida and Mexico to Argentina.

**Andropogon virgatus** Desv. Savannas of the tierra caliente. Extending to the West Indies and Brazil.

**Andropogon virginicus** L. On banks and in sterile fields at low elevations. Panama to the West Indies and United States.

## ANTHEPHORA Schreb.

**Anthephora hermaphrodita** (L.) Kuntze. A common plant of the coasts. Generally distributed in tropical America.

## ANTHOXANTHUM L.

**Anthoxanthum odoratum** L. Frequent in the pastures of the volcanoes, 1,500–2,500 meters, naturalized from Europe. The plant has a sweet, agreeable odor.

## ARISTIDA L.

Reference: A. S. Hitchcock, The North American species of *Aristida*, Contr. U. S. Nat. Herb. 22: 517–586. 1924.

**Aristida capillacea** Lam. Boruca, Buenos Aires, and other regions of little elevation, usually in savannas; region of San Ramón at 1,100 meters. Mexico to Bolivia and Brazil.

**Aristida jorullensis** Kunth. Pacific coast, in dry or sterile fields. Mexico to Panama.

**Aristida ternipes** Cav. Pacific coast, in dry or sterile places. Arizona to Colombia and Cuba.

**Aristida torta** (Nees) Kunth. *A. breviglumis* Mez, Repert. Sp. Nov. 17: 152. 1921 (Buenos Aires, *Tonduz*). Region of Buenos Aires. Extending to Brazil.

## ARTHROSTYLIDIUM Rupr.

**Arthrostylidium Maxonii** Hitchc. Proc. Biol. Soc. Wash. 40: 80. 1927. Wet forests of Santa Clara de Cartago, 1,950 meters, *Maxon 8154;* region south of Cartago, and on the slopes of Barba, 1,400–2,000 meters. Endemic. A bamboo with long, slender stems as much as 4 meters in length.

**Arthrostylidium Pittieri** Hack. Oesterr. Bot. Zeitschr. 53: 75. 1904. Wet forests in the region of the Meseta Central, the type collected near San José. Also in Guatemala.

**Arthrostylidium racemiflorum** Steud. *Carrizo.* Mountains of Guanacaste, and probably in other places on the Pacific slope; region of San Ramón. A slender bamboo with stems as much as 5 meters long.

### ARUNDINARIA Michx.

**Arundinaria Standleyi** Hitchc. Proc. Biol. Soc. Wash. 40: 79. 1927. Wet forest, El Muñeco, Prov. Cartago, 1,400–1,500 meters, *Standley & Torres 51050.* Endemic; known only from the type locality. An erect bamboo, or sometimes almost scandent, the stems as much as 3 meters long.

**Arundinaria viscosa** Hitchc. Proc. Biol. Soc. Wash. 40: 79. 1927. Bosques de Velirla, Copey, 1,800–2,700 meters, *Tonduz 11729.* Cantón de Dota, abundant in many places and forming a dense undergrowth in forest. Also in Venezuela. An erect bamboo, up to 4 meters in height.

### ARUNDINELLA Raddi

**Arundinella Berteroniana** (Schult.) Hitchc. & Chase. Meseta Central, slopes of the volcanoes, and in places of less elevation; common in many localities; region of San Ramón. Mexico to Brazil.

**Arundinella confinis** (Schult.) Hitchc. & Chase. A grass of pastures and open fields. Mexico to the West Indies and Paraguay.

**Arundinella Deppeana** Nees. *Cola de venado.* Common in the Cantón de Dota, Pejivalle, and other regions, ascending to 2,000 meters; region of San Ramón. Mexico and the West Indies to Brazil.

### AVENA L.

**Avena sterilis** L. San José. A European plant, introduced but probably not naturalized.

**Avena sativa** L. *Avena.* The common oats, so important as a grain crop in temperate regions, has been planted experimentally in Costa Rica, but does not thrive in Central America, even in regions where potatoes are grown.

### AXONOPUS Beauv.

**Axonopus aureus** Beauv. A grass of pastures and savannas, at low elevations. Central America to Brazil and Bolivia.

**Axonopus capillaris** (Lam.) Chase. In fields and savannas. Central America to Brazil.

**Axonopus chrysoblepharis** (Lag.) Chase. Savannas of the Pacific coast, at 500 meters or less. Ranging to Paraguay.

**Axonopus compressus** (Swartz) Beauv. *Zacate amargo.* Abundant in waste ground, forests, and thickets, especially in the tierra caliente; Meseta Central, and sometimes in pastures of the volcanoes, ascending to 1,800 meters or higher; Guanacaste; Cocos Island. Generally distributed in tropical America.

**Axonopus Purpusii** (Mez) Chase. *Zacate amargo. Paspalum Purpusii* Mez. Savannas and pastures at low elevations; collected also on the slopes of Barba, 1,800 meters. Mexico to Argentina.

**Axonopus scoparius** (Fluegge) Hitchc. *Pie de paloma.* Savannas and pastures, region of Cartago and elsewhere. Planted in some regions as a pasture grass. Salvador to Brazil and Bolivia.

### BAMBUSA Retz. Bamboo

**Bambusa vulgaris** Schrad. *Bambú.* Planted almost everywhere for ornament, and also for its tall, thick stems, which are utilized in various ways. An Asiatic plant, naturalized in all tropical regions.

### BOUTELOUA Lag.

Reference: David Griffiths, The grama grasses, Contr. U. S. Nat. Herb. 14: 343–428. 1912.

**Bouteloua alamosana** Vasey. Pacific coast. Ranging to northern Mexico.

**Bouteloua americana** (L.) Scribn. Savannas and pastures, at low elevations. Honduras to Venezuela and British Guiana.

**Bouteloua chondrosioides** (HBK.) Benth. Nicoya, 150 meters. Unknown in other parts of Central America. Mexico and southwestern United States.

**Bouteloua pilosa** (Hook. f.) Benth. Savannas of the Pacific coast. Guatemala to Peru.

**Bouteloua repens** (HBK.) Scribn. & Merr. Pacific coast. Mexico to Panama.

### BRACHIARIA Griseb.

**Brachiaria plantaginea** (Link) Hitchc. Wet fields and waste ground, Meseta Central to the coasts, at 1,300 meters or lower. Southern United States to Brazil and Bolivia.

### BRACHYPODIUM Beauv.

**Brachypodium mexicanum** Link. Forests and thickets of the higher mountains. Mexico to Bolivia.

### BRIZA L.

**Briza minor** L. Pastures near Cartago, 1,500 meters. An annual, naturalized from Europe.

### BROMUS L.

**Bromus laciniatus** Beal. *Triguillo. B. proximus* Shear. Meseta Central and slopes of the volcanoes. Guatemala and Mexico.

### CALAMAGROSTIS Adans.

**Calamagrostis intermedia** (Presl) Steud. Paramos of Cerro de Buena Vista, 3,100 meters. A South American species, unknown north of Costa Rica.

**Calamagrostis Pittieri** Hack. Oesterr. Bot. Zeitschr. 52: 108. 1902. Wet paramos of Cerro de Buena Vista, 3,100 meters, the type; also Cerro de La Muerte. Endemic.

### CENCHRUS L. Sandbur

The fruit in this genus is a bur, covered with very sharp spines that penetrate the skin easily or adhere to clothing. The plants are troublesome weeds in cultivated fields.

**Cenchrus echinatus** L. Abundant from the Meseta Central to the coasts. Generally dispersed in tropical America.

**Cenchrus viridis** Spreng. Abundant in waste ground of the coasts, often invading cultivated ground. Generally distributed in tropical America.

**Cenchrus pauciflorus** Benth. Pacific coast, usually on beaches. Argentina to the United States.

### CHAETIUM Nees

**Chaetium bromoides** (Presl) Benth. *Setilla.* Pastures and fields at low elevations; abundant in the Meseta Central and Cantón de Dota. Extending to Mexico.

### CHLORIS Swartz

**Chloris orthonoton** Doell. Pastures and fields, Meseta Central and probably in other regions. Mexico to Brazil.

**Chloris petraea** Swartz. Atlantic coast. Panama to southern United States.

**Chloris radiata** (L.) Swartz. Meseta Central to the coasts, often abundant in cultivated or abandoned fields, at 1,300 meters or less. Generally distributed in tropical America.

## CHUSQUEA Kunth

The plants of this genus are tall bamboos, with thick or slender stems that are used in many ways in the regions where they grow. For Costa Rican species of this genus there have been reported the following names: Bejuco de canasta, Cañuela; Uka (Bribrí); Petara (Guatuso); Krugro, Uirba (Térraba).

**Chusquea Lehmannii** Pilger. Forests of the volcanoes (Cascajal and Poás), 1,500–3,150 meters. Plants 3–6 meters high, forming dense thickets in forests. Also in Colombia.

**Chusquea Meyeriana** Rupr. Cascajal, at 1,650 meters, *Lankester 105*. Also in Brazil and Bolivia.

**Chusquea Pittieri** Hack. Oesterr. Bot. Zeitschr. 53: 153. 1903. *Caña brava*. Cuesta de los Arrepentidos, between San Marcos and Santa María de Dota, 1,400 meters; known only from Cantón de Dota. Endemic. The stems are 3–6 meters long.

**Chusquea serrulata** Pilger. *Caña brava*. Cerro de Las Vueltas and Volcán de Poás, 1,300–3,000 meters. Also in Panama and Colombia. A bamboo 3–6 meters high, often forming dense thickets. The stems, which are 2–5 cm. thick, are used locally for making rockets and a kind of firecracker.

**Chusquea simpliciflora** Munro. Río Naranjo. Ranging from Guatemala to Panama.

**Chusquea subtessellata** Hitchc. Proc. Biol. Soc. Wash. 40: 81. 1927. *Batamba*. Paramos of Cerro de La Muerte, *Tonduz 3367;* Cerro de Las Vueltas, 2,700–3,000 meters. Panama(?). Plants only 1–3 meters high, forming dense thickets in the paramos; stems thick and flexible, almost as hard as iron. The plant is said to be an important source of forage in the elevated region where it is found.

**Chusquea Tonduzii** Hack. Oesterr. Bot. Zeitschr. 53: 155. 1903. Known only from the summit of Volcán de Poás. Endemic.

**Chusquea virgata** Hack. Oesterr. Bot. Zeitschr. 53: 156. 1903. San Marcos, 1,355 meters, type; and El Copey. Endemic.

### CINNA L.

**Cinna poaeformis** (HBK.) Scribn. & Merr. Slopes of the higher mountains, 2,000–3,000 meters. Mexico to Peru.

### COIX L. Job's tears

**Coix Lacryma-Jobi** L. *Lágrimas de San Pedro.* Waste ground, Meseta Central and the coasts, preferring wet soil. Imported from the tropics of the Orient. The handsome, smooth and shining, gray seeds are used for making necklaces, rosaries, and other articles.

### CORTADERIA Stapf

**Cortaderia nitida** (HBK.) Pilger. Bogs in the high mountains, often growing in sphagnum, 2,000–3,000 meters, frequent in Cantón de Dota. Ranging to Peru. The genus *Cortaderia*, typically Andean, does not extend north of Costa Rica.

### CYMBOPOGON Spreng.

**Cymbopogon citratus** (DC.) Stapf. *Zacate de limón, Sontol.* Planted commonly in gardens and often naturalized; native of India. All parts of the plant have a strong and agreeable odor of lemon. The rhizomes are employed for flavoring tobacco, and an infusion, *té de limón,* is a popular domestic remedy.

### CYNODON L. Rich. Bermuda grass

**Cynodon Dactylon** (L.) Pers. *Capriola Dactylon* Kuntze. Common in many places, Meseta Central to the coasts. A species of pantropic distribution. Perhaps the best lawn grass, certainly the one most used, for the tropics. It forms a very dense, close sod that thrives even during long dry seasons. When, however, Bermuda grass invades cultivated ground, it is a bad pest, extremely difficult of eradication.

### DACTYLIS L. Orchard grass

**Dactylis glomerata** L. Naturalized in pastures in the region of El Copey; imported from Europe. Perhaps planted in some places as a pasture grass, a purpose for which it is much used in temperate regions.

### DACTYLOCTENIUM Willd.

**Dactyloctenium aegyptium** (L.) Richt. A common grass of the coasts, growing in waste places, especially about the ports; naturalized from the Old World tropics.

### DIECTOMIS HBK.

**Diectomis fastigiata** (Swartz) HBK. Fields and savannas at low elevations. Widely distributed in the tropics of both hemispheres.

### DIGITARIA Heist. Crab grass

**Digitaria argillacea** (Hitchc. & Chase) Fernald. Atlantic coast. Guatemala to Panama; Greater Antilles.

**Digitaria horizontalis** Willd. Meseta Central to the coasts; common in many places. Widely distributed in tropical regions of both hemispheres.

**Digitaria panicea** (Swartz) Urban. Carrillos de Poás, *Brenes 19303*. Mexico to Panama and West Indies.

**Digitaria sanguinalis** (L.) Scop. *Syntherisma sanguinalis* Dulac. Abundant in waste or cultivated ground, Meseta Central to the coasts. Widely dispersed in both hemispheres.

**Digitaria villosa** (Walt.) Pers. Meseta Central. Ranging to the West Indies and southern United States.

### ECHINOCHLOA Beauv. Barnyard grass

**Echinochloa colonum** (L.) Link. *Panicum colonum* L. Wet or swampy places, Meseta Central to the coasts; introduced from the tropics of the Old World.

**Echinochloa Crus-galli** (L.) Beauv. var. **Crus-pavonis** (HBK.) Hitchc. *Cola de gallo.* Wet or swampy places, Meseta Central to the coasts. Mexico and West Indies to Argentina.

### ELEUSINE Gaertn.

**Eleusine indica** (L.) Gaertn. Meseta Central to the coasts; a common species of waste and cultivated ground. Introduced from the tropics of the Old World.

### EPICAMPES Presl

**Epicampes Emersleyi** (Vasey) Hitchc. Meseta Central and in regions of less elevation; region of San Ramón. Panama to southwestern United States. A coarse grass, as much as 1.5 meters high.

### ERAGROSTIS Host

**Eragrostis amabilis** (L.) Wight & Arn. A delicate annual, growing near the coasts; introduced from the Old World.

**Eragrostis cilianensis** (All.) Link. *E. major* Host; *E. megastachya* Link. Meseta Central to the coasts; a common species of waste and cultivated ground. Naturalized from the Old World.

**Eragrostis ciliaris** (L.) Link. An abundant grass of lowlands, growing in waste ground; probably introduced from the Old World. One of the most common weedy grasses almost throughout tropical America.

**Eragrostis hypnoides** (Lam.) BSP. Wet soil near the coasts. Brazil to the United States.

**Eragrostis limbata** Fourn. Frequent at low and middle elevations; region of San Ramón. Mexico to Bolivia.

**Eragrostis lugens** Nees. Common at middle elevations. Southwestern United States to Argentina.

**Eragrostis maypurensis** (HBK.) Steud. Common in waste ground in the lowlands, and sometimes at higher elevations; region of San Ramón. Mexico to Brazil and Bolivia.

**Eragrostis mexicana** (Lag.) Link. Las Cóncavas, Prov. Cartago. Southwestern United States to Chile. Unknown elsewhere in Central America.

**Eragrostis prolifera** (Swartz) Steud. Pacific coast; a halophilous plant, growing on beaches. Central America to West Indies and Brazil.

**Eragrostis secundiflora** Presl. San Francisco de Guadalupe; the only Central American locality known for the species. Mexico and southwestern United States.

**Eragrostis simpliciflora** (Presl) Steud. Fields and savannas of the Pacific slope. Mexico to Panama.

**Eragrostis tephrosanthos** Schult. Fields and waste ground, at low or middle elevations. Southern United States to Brazil.

## ERIOCHLOA HBK.

**Eriochloa distachya** HBK. In savannas at 1,000 meters or less. Guatemala to Paraguay.

**Eriochloa punctata** (L.) Desv. A perennial plant, growing in wet or boggy places, at 1,000 meters or less. Southern United States to Argentina.

### ERIOCHRYSIS Beauv.

**Eriochrysis cayennensis** Beauv. A perennial grass, growing in swamps at low elevations. Mexico and West Indies to Uruguay.

### FESTUCA L.

**Festuca elatior** L. Meadows of the volcanoes, probably planted as a pasture grass; introduced from Europe.

**Festuca rubra** L. Pastures of Volcán de Turrialba, introduced from Europe.

**Festuca tolucensis** HBK. Pastures of Volcán de Irazú. A Mexican species, unknown elsewhere in Central America.

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It is probable that there grows on the Atlantic coast *Guadua aculeata* Rupr., a native bamboo as large as *Bambusa vulgaris*, armed with hooked spines. The species is abundant in many parts of the coast from Guatemala to Panama, but there are extensive areas where it does not occur.

### GYMNOPOGON Beauv.

**Gymnopogon fastigiatus** Nees. Boruca. Extending to Brazil.

### GYNERIUM Willd.

**Gynerium sagittatum** (Aubl.) Beauv. *Caña blanca, Caña de Castilla. G. saccharoides* Humb. & Bonpl. Abundant in open swamps of the coasts, especially along the Reventazón, where it occupies large areas to the exclusion of most other plants. Southern Mexico to Paraguay. A giant grass, almost as large as a bamboo. Stems as thick as those of sugar cane, employed commonly for the construction of huts in the tierra caliente. In the larger towns the stems are employed in the better houses in place of laths. The stems have many other uses, in their utility being scarcely inferior to bamboo. Pittier states that in Talamanca this grass is so important that the Indians have adopted its flowering season to mark the beginning of their summer. Among the indigenous names reported for the species are: Ukákul, Ukákur (Bribrí); Kagrú, Uká (Cabécara); Bak-krá (Brunka); Soró (Térraba).

### HACKELOCHLOA Kuntze

**Hackelochloa granularis** (L.) Kuntze. *Manisuris granularis* Sw.; *Rytilix granularis* Skeels. Chiefly on the coasts, growing in waste places; San Ramón, 1,050 meters. Naturalized from the Old World.

### HOLCUS L.

**Holcus lanatus** L. *Mielilla. Notholcus lanatus* Nash. Rather common in pastures of the volcanoes and in Santa María de Dota, 1,400–2,800 meters. Perhaps sown for pasture, or introduced by accident with seeds of other pasture grasses. Native of Europe. All parts of the plant are covered with a fine, soft pubescence. In Santa María I was given for this species the name of Raigrá, which is employed ordinarily for *Lolium perenne.*

### HOMOLEPIS Chase

**Homolepis aturensis** (HBK.) Chase. Atlantic coast, in wet places or swamps. Mexico to Brazil and Bolivia.

### HYMENACHNE Beauv.

**Hymenachne amplexicaulis** (Rudge) Nees. Atlantic coast, in wet ground or swamps. Tropics of both hemispheres.

### HYPARRHENIA Fourn.

**Hyparrhenia bracteata** (Humb. & Bonpl.) Stapf. Fields and savannas at low elevations. Mexico to Paraguay. A coarse perennial, 1–2 meters high.

### ICHNANTHUS Beauv.

**Ichnanthus axillaris** (Nees) Hitchc. & Chase. *Panicum axillare* Nees. In forests of the lowlands. Central America and West Indies to Brazil and Ecuador.

**Ichnanthus nemorosus** (Swartz) Doell. Wet forests and thickets, abundant in many places, 1,000–2,000 meters; sometimes in localities of less elevation; Guanacaste. Mexico to Panama and West Indies.

**Ichnanthus pallens** (Swartz) Munro. *Panicum pallens* Swartz. Wet forests, region of Cartago to the coasts; region of San Ramón; Guanacaste; at 1,400 meters or less. Generally distributed in tropical America.

**Ichnanthus tenuis** Presl. Wet forests at low and middle elevations; region of San Ramón. Ranging to Trinidad and Colombia.

### IMPERATA Cyrillo

**Imperata contracta** (HBK.) Hitchc. In savannas at low elevations; Guanacaste, common in the region of Tilarán. Mexico and West Indies to Brazil and Chile.

## ISACHNE R. Br.

**Isachne arundinacea** (Swartz) Griseb. A vine or a more or less clambering plant, its stems as much as 6 meters long, growing in wet forests and thickets, 500–2,000 meters; region of San Ramón. Mexico to Jamaica, Venezuela, and Bolivia.

**Isachne polygonoides** (Lam.) Doell. Wet savannas and swampy places, at low and middle elevations. Guatemala to Brazil.

## ISCHAEMUM L.

**Ischaemum latifolium** (Spreng.) Kunth. Cantón de Dota, and in other regions. Southern Mexico to West Indies, Brazil, and Ecuador.

## IXOPHORUS Schlecht.

**Ixophorus unisetus** (Presl) Schlecht. *Zacate de Honduras.* Swampy places in the lowlands; abundant in Guanacaste, where it is sometimes planted for pasture. Mexico to Colombia.

## LASIACIS (Griseb.) Hitchc.

Except for *L. procerrima,* the plants of this genus are vines or more or less clambering shrubs with elongate and branched stems.

**Lasiacis divaricata** (L.) Hitchc. *Panicum divaricatum* L. Abundant in forests and thickets of the lowlands; region of San Ramón. Florida and Mexico to West Indies and Argentina.

**Lasiacis oaxacensis** (Steud.) Hitchc. Tierra caliente of both coasts; abundant in Guanacaste. Mexico to Ecuador.

**Lasiacis procerrima** (Hack.) Hitchc. Proc. Biol. Soc. Wash. 24: 145. 1911. *Panicum procerrimum* Hack. Oesterr. Bot. Zeitschr. 51: 431. 1901. Type collected near San José. Meseta Central to the coasts. Mexico to Venezuela. A coarse, erect, herbaceous plant, as much as 4 meters high.

**Lasiacis rhizophora** (Fourn.) Hitchc. *Panicum rhizophorum* Fourn. Wet forests, Meseta Central and on both slopes at lower elevations; mountains, at 500–2,000 meters. Extending to Mexico.

**Lasiacis ruscifolia** (HBK.) Hitchc. *Panicum ruscifolium* HBK. Wet thickets and forests of the coasts, ascending to 900 meters. Mexico and West Indies to Peru.

**Lasiacis scabrior** Hitchc. Meseta Central and other regions, at 1,300 meters or less. Guatemala to Panama.

**Lasiacis Sloanei** (Griseb.) Hitchc. *Panicum Sloanei* Griseb. Turrialba. Mexico and West Indies to Colombia.

**Lasiacis sorghoidea** (Desv.) Hitchc. & Chase. *Carricillo, Carricillo trepador. Panicum sorghoideum* Desv. Common in the Meseta Central and other regions of middle elevation; region of San Ramón. Mexico and West Indies to Argentina and Bolivia. It is probable that the name Carricillo is given to all the Costa Rican species.

**Lasiacis Standleyi** Hitchc. Proc. Biol. Soc. Wash. 40: 86. 1927. La Tejona, north of Tilarán, Guanacaste, 800 meters, *Standley & Valerio 45839.* Wet forests of the mountains of Guancaste; region of San Ramón; El General. Endemic.

### LEERSIA Swartz

**Leersia grandiflora** (Doell) Prodoehl. Meseta Central and regions of less elevation. Southern United States and Mexico to Brazil.

**Leersia hexandra** Swartz. *Tepalón. Homalocenchrus hexandrus* Kuntze. Swamps or wet soil at low and middle elevations, usually near the coasts. Southern United States and Mexico to Brazil.

### LEPTOCHLOA Beauv.

**Leptochloa filiformis** (Lam.) Beauv. A common grass of the coasts. Generally distributed in tropical America.

**Leptochloa scabra** Nees. Wet soil of the coasts. Widely dispersed in tropical America.

**Leptochloa virgata** (L.) Beauv. Abundant in moist ground at low and middle elevations; region of San Ramón. Generally distributed in tropical America.

### LEPTOCORYPHIUM Nees

**Leptocoryphium lanatum** (HBK.) Nees. Dry or sterile places, Meseta Central and in other regions of slight or middle elevation. Mexico and West Indies to Argentina.

### LITHACHNE Beauv.

**Lithachne pauciflora** (Swartz) Beauv. Wet forests of the coasts, ascending to 2,000 meters. Mexico and West Indies to Argentina. A low plant with broad leaves. Referred by many authors to the genus *Olyra.*

## LOLIUM L.

**Lolium perenne** L. *Raigrás, Raigrá.* Commonly sown for pasture in almost all the meadows of the volcanoes. Imported from Europe. The local name is, of course, a modification of the English "rye grass."

## MELINIS Beauv.

**Melinis minutiflora** Beauv. *Zacate gordura.* A grass of African origin, sometimes sown for pasture, and completely naturalized in some places, as in Santa María de Dota; region of San Ramón. This plant has a strong odor, and possesses properties that seem to repel insects. It is claimed that cattle pasturing in fields of it are free from ticks.

## MEROSTACHYS Spreng.

**Merostachys multiramea** Hack. *Carrizo.* La Palma de San Ramón, 1,050 meters, *Brenes 5433.* Also in Brazil. A slender bamboo, growing in forest clearings. The genus is unknown elsewhere in North America.

## MUHLENBERGIA Schreb.

**Muhlenbergia ciliata** (HBK.) Kunth. In shaded places, 700–2,000 meters. Mexico to Panama.

**Muhlenbergia diversiglumis** Trin. Meseta Central, forests and on open banks, 1,000–1,800 meters. Mexico to Peru.

**Muhlenbergia implicata** (HBK.) Kunth. Meseta Central and other regions of middle elevation, 1,000–2,000 meters. Mexico to Venezuela.

**Muhlenbergia quadridentata** (HBK.) Kunth. *M. flabellata* Mez, Repert. Sp. Nov. 17: 213. 1921 (Cerro de Buena Vista, *Pittier*). Known in Central America only from Cerro de Buena Vista, at 3,100 meters. Also in Mexico.

**Muhlenbergia setarioides** Fourn. In forest or other shaded places, Meseta Central and slopes of the volcanoes, 1,000–2,000 meters. Mexico to Panama.

**Muhlenbergia tenella** (HBK.) Trin. *Zacate de seda.* A common species of the Meseta Central, in shaded places. Mexico to Panama.

## OLYRA L.

**Olyra caudata** Trin. *O. Pittieri* Hack. Oesterr. Bot. Zeitschr. 51: 461. 1901. Known in North America only from forests of El

Cordoncillal, 300–500 meters, type locality of *O. Pittieri*. British Guiana to Brazil and Peru.

**Olyra lateralis** (Presl) Chase. In forests at 700–1,100 meters. A South American species, known in Central America only from Costa Rica. It has been collected in El General and elsewhere.

**Olyra latifolia** L. *Gamalote.* Common in wet forests of the coasts; Guanacaste. A coarse grass resembling a bamboo, sometimes as much as 5 meters high but usually lower. Mexico and West Indies to Brazil and Bolivia.

**Olyra Standleyi** Hitchc. Proc. Biol. Soc. Wash. 40: 86. 1927. Wet forest, El Muñeco, Prov. Cartago, 1,400–1,500 meters, *Standley & Torres 50932.* Endemic; known only from the region of El Muñeco.

### OPLISMENUS Beauv.

Reference: A. S. Hitchcock, The North American species of *Oplismenus,* Contr. U. S. Nat. Herb. 22: 123–132. 1920.

**Oplismenus Burmannii** (Retz.) Beauv. *Zacate de ratón. O. Humboldtianus* Nees. Meseta Central to the coasts; abundant in moist places of the coasts, especially in banana plantations. Pantropic in distribution. Said to be a native of the Old World, but to one who has seen its present abundance in America, this seems improbable. It is one of the most common weeds of Central America.

**Oplismenus hirtellus** (L.) Beauv. Meseta Central to the coasts, an abundant grass of forests and wet places. Generally distributed in tropical America.

### ORTHOCLADA Beauv.

**Orthoclada laxa** (L. Rich.) Beauv. Common in forests of the Atlantic coast. Mexico to Brazil and Peru.

### ORYZA L.

**Oryza latifolia** Desv. Wet or swampy places of the Atlantic coast, perhaps also on the Pacific slope. A native plant that it is almost impossible to distinguish from cultivated rice. It is said that in the Amazon region its seeds have been employed for food. Guatemala and West Indies to Brazil.

**Oryza sativa** L. *Arroz. Rice.* A plant native in the Orient. Rice of good quality, but insufficient for local consumption, is grown in all inhabited portions of the Pacific slope and in the plains of San

Carlos and Sarapiquí. Only the upland variety is grown, this needing no irrigation in its cultivation. Indigenous names reported for rice are: Iok-koro (Térraba); Sunoji-ku (Guatuso).

## PANICUM L.

Reference: A. S. Hitchcock and A. Chase, Tropical North American species of *Panicum*, Contr. U. S. Nat. Herb. 17: 459–539. 1915.

The largest genus of grasses, composed of about 500 species. From Central America 65 species are known.

**Panicum altum** Hitchc. & Chase. Buenos Aires. British Honduras to Panama; Trinidad and Tobago.

**Panicum boliviense** Hack. Reported as collected in El General by Skutch. Guatemala to Paraguay.

**Panicum cayennense** Lam. Buenos Aires. Central America and West Indies to Brazil.

**Panicum cordovense** Fourn. Piedra del Convento, *Pittier*. Mexico to Brazil and Bolivia.

**Panicum fasciculatum** Swartz. *P. fuscum* Swartz. On the coasts and sometimes in regions of middle elevation; common in waste places and often in cultivated ground. Generally distributed in tropical America.

**Panicum frondescens** Mey. Swampy places along the Atlantic coast. Mexico to Brazil.

**Panicum geminatum** Forsk. Wet or swampy places, Guanacaste (Bebedero) and probably in other regions. Tropics of both hemispheres.

**Panicum Ghiesbreghtii** Fourn. Meseta Central to the Pacific coast. Mexico to Brazil and Bolivia.

**Panicum glutinosum** Swartz. Wet forests at middle elevations; region of San Ramón. Mexico and West Indies to Paraguay.

**Panicum Haenkeanum** Presl. *P. costaricense* Hack. Oesterr. Bot. Zeitschr. 51: 428. 1901 (between Buenos Aires and Térraba, *Pittier 3636*). Reported also from Boruca and El Cordoncillal. Mexico to Venezuela.

**Panicum helobium** Mez. Swampy places in forests, region of Santa María de Dota, 1,500–1,800 meters. A South American species, unknown elsewhere in Central America.

**Panicum hirsutum** Swartz. Wet places of both coasts. Mexico and West Indies to Brazil and Ecuador.

**Panicum hirticaule** Presl. Pacific coast, and probably in other regions. Southwestern United States to Bolivia.

**Panicum laxum** Swartz. *Tepalón.* Abundant on the coasts, and sometimes in regions of middle elevation; region of San Ramón. Mexico and West Indies to Paraguay.

**Panicum maximum** Jacq. *Guinea, Zacate de Guinea.* Probably native of Africa, planted almost everywhere, but especially in the lowlands, as pasture for stock; Cocos Island. Pittier states that the seed was first brought to Costa Rica about 1885 by Don Santiago Millet. This is considered the best pasture grass everywhere in the tierra caliente of Central America.

**Panicum megiston** Schult. Guanacaste, and probably in swamps of other regions. Mexico and Cuba to Paraguay.

**Panicum molle** Swartz. Pacific coast (Puntarenas), and probably in other regions. Mexico and Cuba to Argentina.

**Panicum olivaceum** Hitchc. & Chase. Meseta Central and slopes of the volcanoes; Cantón de Dota; common in some regions, 1,200–1,800 meters. Mexico to Colombia and Venezuela.

**Panicum orbiculatum** Poir. Meseta Central and Atlantic slope. Southern Mexico to West Indies and Paraguay.

**Panicum parvifolium** Lam. Savannas of Buenos Aires. Not known elsewhere in Central America. West Indies to Paraguay.

**Panicum parviglume** Hack. Oesterr. Bot. Zeitschr. 51: 429. 1901. Río Torres, near San José, *Pittier 9080.* Meseta Central. Also in Mexico.

**Panicum pilosum** Swartz. Common in the lowlands, in wet or swampy places. Mexico and West Indies to Paraguay.

**Panicum polygonatum** Schrad. Common in wet places of the tierra caliente; region of San Ramón; Cocos Island. Mexico to Paraguay.

**Panicum pulchellum** Raddi. Meseta Central and in the lowlands; a plant of shaded places; region of San Ramón. Mexico and West Indies to Brazil.

**Panicum purpurascens** Raddi. *Pará, Zacate de Pará. P. barbinode* Trin.; *P. molle* of some authors, not of Swartz. Planted generally for forage on the Atlantic slope, up to 1,400 meters; also

on the Pacific slope. Perhaps introduced to Costa Rica from Brazil or elsewhere. Tropics of both hemispheres.

**Panicum Rudgei** Roem. & Schult. Savannas of El General, Buenos Aires, and other localities of that general region. Central America and West Indies to Brazil.

**Panicum Schiffneri** Hack. Meseta Central. Mexico and West Indies to Brazil.

**Panicum Sellowii** Nees. El General. Mexico and West Indies to Paraguay.

**Panicum sphaerocarpon** Ell. Meseta Central and Cantón de Dota, 1,200–1,800 meters. Eastern United States to Venezuela.

**Panicum stenodes** Griseb. Buenos Aires. Guatemala and West Indies to Brazil.

**Panicum stenodoides** Hubbard. Buenos Aires. British Honduras, Panama, and Trinidad.

**Panicum strigosum** Muhl. Meseta Central. Colombia to West Indies and United States.

**Panicum trichanthum** Nees. Common in wet forests of the Atlantic coast. Mexico and West Indies to Paraguay.

**Panicum trichoides** Swartz. Abundant in the lowlands, ascending to at least 1,100 meters. One of the most common weedy grasses of all the tierra caliente of Central America. Dispersed throughout tropical America.

**Panicum virgultorum** Hack. Oesterr. Bot. Zeitschr. 51: 369. 1901. La Verbena, near Alajuelita, *Tonduz 8829*. A common species of the Meseta Central; region of San Ramón. Mexico to Panama.

**Panicum viscidellum** Scribn. Meseta Central; El Muñeco; El General. Mexico and Cuba to Colombia.

**Panicum xalapense** HBK. Regions of Cartago and Dota. Extending to the United States; Hispaniola.

**Panicum zizanioides** HBK. Wet or swampy places of the Atlantic coast. Mexico and West Indies to Paraguay.

### PARIANA Aubl.

**Pariana zingiberina** Doell. Wet forests of the Atlantic coast. Ranging to Brazil. The genus, otherwise South American, does not extend north of Costa Rica.

## PASPALUM L.

Reference: Agnes Chase, The North American species of *Paspalum*, Contr. U. S. Nat. Herb. 28: 1–310. 1929.

One of the largest genera of grasses, with 380 species, of which at least 67 are known in Central America.

**Paspalum candidum** (Humb. & Bonpl.) Kunth. Common in the Meseta Central and slopes of the volcanoes; region of San Ramón; 1,100–1,800 meters. Southern Mexico to Chile.

**Paspalum centrale** Chase. Pacific Coast (Puntarenas and Atenas). Salvador to Panama.

**Paspalum clavuliferum** C. Wright. *P. Pittieri* Hack. ex Beal, Grasses N. Amer. 2: 88. 1896. Llanos de Turrucares, *Pittier*. Southern Mexico and Cuba to Brazil.

**Paspalum conjugatum** Berg. *Turvará*. Meseta Central to the coasts, abundant in wet or waste places, often in cultivated ground. Pantropic in distribution.

**Paspalum convexum** Humb. & Bonpl. Meseta Central to the Pacific coast. Mexico to Brazil.

**Paspalum costaricense** Mez, Repert. Sp. Nov. 15: 72. 1917. *Zacate de caballo*. San José, *Tonduz*. Meseta Central and Cantón de Dota. Also in Guatemala and Salvador.

**Paspalum decumbens** Swartz. Common in the tierra caliente, ascending to 900 meters; Cocos Island. Guatemala and West Indies to Brazil and Bolivia.

**Paspalum dilatatum** Poir. Meseta Central; meadows of Volcán de Turrialba. Believed to be a native of South America, but now widely introduced elsewhere. It is said to have considerable value as a pasture grass.

**Paspalum distichum** L. Meseta Central and at middle elevations on the Atlantic slope. Widely distributed in America.

**Paspalum fasciculatum** Willd. *Gamalote*. Meseta Central and on the coasts, abundant in many places. The Guatuso name for the species is reported by Lehmann as Tónun.

**Paspalum Humboldtianum** Fluegge. Meseta Central. Mexico to Argentina.

**Paspalum Jimenezii** Chase, Contr. U. S. Nat. Herb. 28: 159. *f. 101*. 1929. Río Bebedero, Las Playitas, Guanacaste, *Otón Jiménez 742*. Endemic, and known only from the original collection.

**Paspalum Langei** (Fourn.) Nash. Reported for Costa Rica by Hitchcock and Chase, without indication of the locality. Southern United States to Venezuela.

**Paspalum lineare** Trin. Known on the North American continent only from Cabagra, where it was collected by Tonduz. Cuba to Argentina.

**Paspalum microstachyum** Presl. On the coasts. Guatemala to Ecuador and Brazil.

**Paspalum minus** Fourn. A grass of the coasts; collected also at San José. Mexico and West Indies to Paraguay.

**Paspalum multicaule** Poir. Grecia; Buenos Aires; Boruca; region of San Ramón, ascending to 1,050 meters. Southern Mexico and West Indies to Brazil.

**Paspalum notatum** Fluegge. *Gengibrillo.* Meseta Central to the coasts. Mexico and West Indies to Argentina.

**Paspalum nutans** Lam. Pejivalle; San José; El General. Central America and West Indies to Brazil.

**Paspalum paniculatum** L. Abundant in many places, Meseta Central to the coasts. Tropics of both hemispheres.

**Paspalum pectinatum** Nees. Guanacaste; Puntarenas. Honduras to Brazil.

**Paspalum pictum** Ekman. *P. maculatum* Nash, N. Amer. Fl. 17: 186. 1912 (savannas of Boruca, *Pittier 4474*). Ranging to Brazil and Bolivia. Known in North America only from Costa Rica.

**Paspalum pilosum** Lam. Meseta Central; Turrialba; Pacific slope. Ranging to Brazil and Bolivia.

**Paspalum plenum** Chase. Nuestro Amo; Agua Caliente. Southern Mexico to Colombia.

**Paspalum plicatulum** Michx. Meseta Central to the coasts. Southern United States to Argentina.

**Paspalum propinquum** Nash. Puntarenas. Florida and Mexico to Panama.

**Paspalum repens** Berg. Guanacaste and Puntarenas; an aquatic plant. Southern United States to Paraguay.

**Paspalum saccharoides** Nees. Atlantic coast; region of San Ramón. Extending to West Indies and Bolivia.

**Paspalum squamulatum** Fourn. Meseta Central and slopes of the volcanoes; Cantón de Dota; in pastures and shady places. Ranging to Mexico.

**Paspalum stellatum** Humb. & Bonpl. Boruca. Southern Mexico to Argentina. A species easy of recognition because of the broad, yellow wings of the axis of the flower spike.

**Paspalum Tonduzii** Mez, Repert. Sp. Nov. 15: 72. 1917. In cornfields, Santa Rosa del Copey, 1,800 meters, *Tonduz 11767*. Endemic.

**Paspalum vaginatum** Swartz. Atlantic coast. Southern United States to Argentina and Chile.

**Paspalum variabile** (Fourn.) Nash. Guanacaste. A Mexican species, unknown elsewhere in Central America.

**Paspalum virgatum** L. Meseta Central to the coasts; Cocos Island; abundant in many places, growing in moist or swampy ground. Texas to West Indies and Brazil.

## PENNISETUM L. Rich.

Reference: Agnes Chase, The North American species of *Pennisetum*, Contr. U. S. Nat. Herb. 22: 209–234. 1921.

**Pennisetum bambusiforme** (Fourn.) Hemsl. Guápiles, El Copey, and probably in other regions, at 1,800 meters or less; region of San Ramón. Mexico to Peru. Stems branched, as much as 5 meters high; flowers arranged in dense spikes 5–12 cm. long.

**Pennisetum distachyum** (Fourn.) Rupr. Chiefly in the Meseta Central, in thickets and on stream banks, also at San Ramón. Mexico and Central America. Stems 1–4 meters high.

**Pennisetum purpureum** Schumacher. *Yerba elefante*. Native of Africa, planted in some regions (Dota, etc.) for forage. Spikes conspicuously tinged with purple.

**Pennisetum setosum** (Swartz) L. Rich. Pacific slope, at low elevations, in fields and savannas, forming dense clumps 1–2 meters high. Widely distributed in tropical America.

**Pennisetum vulcanicum** Chase. Nuestro Amo. Also in Salvador.

## PEREILEMA Presl

**Pereilema Beyrichianum** (Kunth) Hitchc. Llano Grande de Puriscal. A South American species, known in North America only from Costa Rica.

**Pereilema crinitum** Presl. Meseta Central and regions of middle elevation, growing on moist banks and in shaded places. Mexico to Ecuador.

## PHALARIS L.

**Phalaris arundinacea** L. var. **picta** L. *Zacate de listón.* A European grass, grown for ornament in gardens. The green leaves are striped with yellowish white. The plant rarely blooms in cultivation.

## PHARUS L.

**Pharus cornutus** Hack. Oesterr. Bot. Zeitschr. 52: 9. 1902. An endemic grass, growing in moist or wet places at low elevations, the type collected at Tsaki; at 200–500 meters.

**Pharus glaber** L. *P. Mezii* Prodoehl, Bot. Archiv Mez 1: 250. 1922 (type from Costa Rica). Abundant in wet forests of the tierra caliente, ascending to 1,100 meters. Mexico and Guatemala to Brazil. The large leaves are lanceolate and 3–5 cm. wide. The Bribrí name is reported as Tsubúk-uo.

**Pharus latifolius** L. *Yerba de hierro* (Cufodontis). Common in wet forests of the coast regions. Guatemala and West Indies to Brazil.

**Pharus parvifolius** Nash. Wet forests of the tierra caliente; common in Guanacaste. Mexico and West Indies to Brazil.

## PHRAGMITES Adans.

**Phragmites communis** Trin. Abundant in swamps of coast regions, especially on river banks, sometimes forming colonies of large extent. In temperate regions almost throughout the earth, and extending into the tropics. A coarse plant, 2–3 meters high, its stems as thick as a finger, the leaves ashy green. The stems are employed for many purposes by the people of the coastal regions of Costa Rica.

## POA L.

**Poa annua** L. *Zacate de ratón.* Abundant in almost all meadows of the higher mountains; growing on Poás Volcano in sphagnum

bogs. An annual grass, here doubtless imported from Europe. Widely dispersed in temperate regions of both hemispheres.

**Poa pratensis** L. Pastures of Volcán de Turrialba, and probably in those of other volcanoes. Imported from Europe, and widely naturalized in temperate regions of America. A favorite pasture and lawn grass (bluegrass) in many parts of the earth.

### POLYPOGON Desf.

**Polypogon elongatus** HBK. Common in the Meseta Central and pastures of the volcanoes; region of Dota; growing in swamps or wet meadows. Mexico to Argentina.

### PSEUDECHINOLAENA Stapf

**Pseudechinolaena polystachya** (HBK.) Stapf. Meseta Central; Pejivalle; on shaded banks or sometimes in cultivated fields, 900–1,500 meters. Mexico to Bolivia and Uruguay; tropical Africa.

### RADDIA Bertol.

**Raddia concinna** (Hook. f.) Chase, Proc. Biol. Soc. Wash. 21: 185. 1908. *Olyra concinna* Hook. f. in Curtis' Bot. Mag. III. 52: *pl. 7469*. 1896. Wet forests of the Atlantic coast (Hamburg Finca). Known only from Costa Rica; described from plants believed to have grown from Costa Rican seeds in greenhouses of the Kew Gardens, London. A low perennial with short, broad leaves, forming small, dense tufts somewhat suggestive of a tiny bamboo.

**Raddia costaricensis** Hitchc. Proc. Biol. Soc. Wash. 40: 87. 1927. Forests of Río Hondo, near Madre de Dios, 200 meters, *Pittier 10352*. Endemic.

### ROTTBOELLIA L. f.

**Rottboellia aurita** Steud. Savannas of the tierra caliente. Extending to Argentina and Bolivia.

### SACCHARUM L. Sugar cane

**Saccharum officinarum** L. *Caña, Caña de azúcar*. A native of the Orient, sugar cane is one of the most important economic plants of Costa Rica. It is cultivated chiefly in the temperate regions but also in almost every part of the tierra caliente. Two main varieties are grown locally, yellow and purple, the former chiefly as a source of sugar, the latter for forage for stock. Among indigenous names cited for this plant are the following: Ipacru,

Ipákur (Bribrí); Pashtu (Cabécara); Soror-bó (Térraba); Budi (Boruca); Afó-fora (Guatuso).

### SETARIA Beauv.

Reference: A. S. Hitchcock, The North American species of *Chaetochloa*, Contr. U. S. Nat. Herb. 22: 155–208. 1920. (The generic name *Chaetochloa* is a synonym of *Setaria*.)

**Setaria geniculata** (Lam.) Beauv. Abundant in almost all inhabited regions, Meseta Central to the coasts; often abundant in cultivated ground. Generally distributed in tropical America, but without economic value, since it is not useful for pasture or forage. A low, perennial grass with dense, yellowish flower spikes.

**Setaria magna** Griseb. Pacific coast. Ranging to the West Indies and United States. An annual as much as 4 meters high.

**Setaria paniculifera** (Steud.) Fourn. *Zacate de mula.* Meseta Central to the coasts, in wet forests or swamps. Mexico to West Indies and Colombia. A perennial grass, sometimes 4 meters high, the leaves as much as 10 cm. wide.

**Setaria scandens** Schrad. Meseta Central. Guatemala to West Indies and Paraguay.

**Setaria tenacissima** Schrad. Meseta Central; Cañas Gordas. Guatemala to West Indies and Brazil.

**Setaria viridis** (L.) Beauv. Pastures near Cartago; the only Central American locality known for the species, which is European in origin. In the United States this grass is one of the worst pests of cultivated ground.

**Setaria vulpiseta** (Lam.) Roem. & Schult. Atlantic coast and probably in other regions; region of San Ramón. Southern Mexico to West Indies, Argentina, and Peru. A coarse plant, as much as 2 meters high.

### SORGHASTRUM Nash

**Sorghastrum incompletum** (Presl) Nash. Dry fields and savannas at low elevations. Mexico to Venezuela; tropical Africa. It is probable that there grows in Costa Rica also *S. nutans* (L.) Nash, which is known from Honduras and Panama.

### SORGHUM Moench

**Sorghum halepense** Pers. *Holcus halepensis* L. Waste or cultivated ground. Naturalized from Europe, but not common in

Costa Rica. In the United States this (Johnson grass) is considered one of the worst weeds of cultivated land.

**Sorghum vulgare** Pers. *Maicillo, Maíz de millo. Holcus Sorghum* L. A plant of the Old World, cultivated in some parts of Costa Rica as forage and for its seeds. A tall plant, much like maize in habit, its spikes of fruit forming a large, rounded inflorescence. A form of the species with large, open panicles is cultivated for use in manufacture of brooms.

### SPARTINA Schreb.

**Spartina Spartinae** (Trin.) Merrill. *S. Pittieri* Hack. Oesterr. Bot. Zeitschr. 52: 237. 1902 (type from Costa Rica). A grass of sea beaches, known in Central America only from Limón. Ranging to Mexico and southern United States.

### SPOROBOLUS R. Br.

**Sporobolus ciliatus** Presl. Savannas of the Pacific slope. Honduras to Brazil.

**Sporobolus cubensis** Hitchc. Savannas of Cañas Gordas. Extending to the West Indies, Venezuela, and British Guiana.

**Sporobolus elongatus** R. Br. Meseta Central and slopes of the volcanoes, ascending to 2,000 meters; also in the lowlands. Widely distributed in tropical America, perhaps naturalized from Asia.

**Sporobolus indicus** (L.) R. Br. *Pitilla.* Savannas and dry fields at low elevations. Generally distributed in tropical America.

**Sporobolus littoralis** (Lam.) Kunth. A halophilous plant of sea beaches. Florida to Brazil.

**Sporobolus minutissimus** (Steud.) Hitchc. *S. confusus* Vasey. Meseta Central and regions of less elevation. Extending to western United States.

**Sporobolus purpurascens** (Swartz) Hamilt. In fields at low or middle elevations. Mexico and West Indies to Brazil and Bolivia.

**Sporobolus ramulosus** (HBK.) Kunth. Pastures of Irazú. Extending to southwestern United States.

### STENOTAPHRUM Trin.

**Stenotaphrum secundatum** (Walt.) Kuntze. Common in the coasts. Southern United States to Argentina.

## STIPA L.

**Stipa Ichu** (Ruiz & Pavón) Kunth. Cerros de Escasú; abundant on grassy slopes, the long, slender, and very tough leaves forming dense clumps. Mexico to Chile. This is the celebrated ichu grass of the Andean paramos, where it is often the dominant species, and is used extensively for thatch and fuel.

## STREPTOCHAETA Schrad.

**Streptochaeta Sodiroana** Hack. Wet forests of the Atlantic coast. Honduras to Ecuador. A coarse and showy grass with broad leaves as much as 7 cm. wide.

## STREPTOGYNE Beauv.

**Streptogyne crinita** Beauv. Wet forests of the Atlantic coast. Mexico to Trinidad and Brazil. A perennial grass, 1–1.5 meters high, its leaves 1–1.5 cm. wide.

## THRASYA HBK.

**Thrasya campylostachya** (Hack.) Chase, Proc. Biol. Soc. Wash. 24: 115. 1911. *Panicum campylostachyum* Hack. Oesterr. Bot. Zeitschr. 51: 367. 1901. Type collected at Cañas Gordas. Ascending to 1,200 meters. Guatemala to Bolivia.

## TRACHYPOGON Nees

**Trachypogon Montufari** (HBK.) Nees. Dry fields and savannas at low elevations. Southwestern United States to Uruguay.

**Trachypogon Montufari** var. **mollis** (Nees) Anderss. In savannas. A form of the species with densely villous foliage.

## TRICHACHNE Nees

**Trichachne insularis** (L.) Nees. *Valota insularis* Chase. A common grass of fields and pastures, Meseta Central to the coasts. Generally distributed in tropical America. The soft, silky flower panicles are used for decorating altars and *nacimientos*.

**Trichachne Pittieri** (Hack.) Hitchc. Proc. Biol. Soc. Wash. 40: 83. 1927. *Panicum Pittieri* Hack. Oesterr. Bot. Zeitschr. 51: 367. 1901. *Valota Pittieri* Chase, Proc. Biol. Soc. Wash. 19: 188. 1906. Meseta Central, 1,000–2,000 meters, the type from Río Tiribí. Endemic.

## TRICHOLAENA Schrad.

**Tricholaena rosea** Nees. *Ilusión, Zacate de seda.* An African grass, thoroughly naturalized in the Meseta Central, Pacific coast,

and probably other regions, abundant in many places. It is common in many parts of Central America. The silky panicles are handsomely colored with pink or purple.

### TRINIOCHLOA Hitchc.

**Triniochloa stipoides** (HBK.) Hitchc. Meadows of the higher mountains, 2,000–3,000 meters. Mexico to Bolivia.

### TRIPSACUM L.

**Tripsacum laxum** Nash. *Maicillo, Caña de la India.* Planted on the coasts and in regions of middle elevation for forage; naturalized in some places. Mexico to Colombia. A tall grass as much as 5 meters high, the stems 2.5 cm. thick.

### TRISETUM Pers.

**Trisetum irazuense** (Kuntze) Hitchc. Proc. Biol. Soc. Wash. 40: 82. 1927. *Calamagrostis irazuensis* Kuntze, Rev. Gen. 763. 1891 (Volcán de Irazú, *Kuntze*). Meadows of Irazú and Turrialba, 2,000–3,000 meters. Ranging to Ecuador.

**Trisetum Pringlei** (Scribn.) Hitchc. Paramos of Cerro de Las Vueltas, 3,000 meters. Panama to Mexico.

**Trisetum viride** (HBK.) Kunth. Meadows of the high mountains, 2,000–2,500 meters. A Mexican species, known in Central America only from Costa Rica.

### TRITICUM L.

**Triticum aestivum** L. *Trigo.* Wheat is said to grow well in the temperate regions of Costa Rica, and has been planted on a small scale, but it is grown only experimentally.

### UNIOLA L.

**Uniola Pittieri** Hack. Oesterr. Bot. Zeitschr. 52: 309. 1902. Type collected at the Bay of Salinas; Pacific coast, on sea beaches. Mexico to Ecuador. A tall, coarse grass, with large panicles of handsome, flat spikelets 1–2 cm. long.

### ZEA L. Maize

**Zea Mays** L. *Maiz.* Maize and beans are the two important Costa Rican products for local consumption. Maize is cultivated from sea level to the uppermost limit of cultivation on the higher mountains, three crops a year being obtained sometimes in the tierra

caliente, one only in the cold regions. All the corn grown is of the hard-kerneled or flint type. Believed to be of Mexican origin, maize has never been found in a wild state. Its only close relative that does grow wild is teosinte (*Euchlaena*), of Guatemala and Mexico. It is believed by some authorities that maize is a hybrid between teosinte and some other unknown grass. It has been grown in Costa Rica doubtless since the very beginning of agriculture, and reached Peru long before the Spanish conquest. Indigenous Costa Rican names reported for maize are: Ik (Cabécara, Bribrí); Ip (Térraba), Aí (Guatuso); Rukrá (Brunka); Ikué (Talamanca); Ko-ep, Cup (Boruca).

### ZEUGITES P. Br.

**Zeugites mexicana** (Kunth) Trin. *Senites mexicana* Hitchc. Meseta Central, Cantón de Dota, and probably elsewhere; shaded places, often abundant, 1,000–2,000 meters. Mexico to Bolivia.

**Zeugites Pittieri** Hack. Oesterr. Bot. Zeitschr. 52: 373. 1902. Wet forest, 500–1,100 meters. Type from Alto del Rodeo. Endemic.

## CYPERACEAE. Sedge Family

References: C. B. Clarke, The Cyperaceae of Costa Rica, Contr. U. S. Nat. Herb. 10: 443–471. 1902; Paul C. Standley, The Cyperaceae of Central America, Field Mus. Bot. 8: 239–292. 1931.

Although so similar to grasses in general appearance, the Cyperaceae have few or none of the important economic uses of that family.

### CALYPTROCARYA Nees

**Calyptrocarya glomerulata** (Brongn.) Urban. *C. fragifera* Kunth. Atlantic coast; Cocos Island. British Honduras to South America.

### CAREX L.

The largest genus of the family, with numerous species in most temperate and arctic regions, but with very few in the tropics, and then not in the hotter regions.

**Carex albolutescens** Schwein. Slopes of the volcanoes, 1,500–1,800 meters, wet places, often in sphagnum bogs. United States to northern South America.

**Carex Bonplandii** Kunth. *C. heptastachya* Boeckl. Linnaea 39: 114. 1875 (based upon Costa Rican material); *C. Durandii* Boeckl. Allgem. Bot. Zeitschr. 2: 189. 1896 (type from Costa Rica).

Higher mountains, 2,400–3,100 meters. A South American species, unknown north of Costa Rica.

**Carex Donnell-Smithii** Bailey. *C. viridis* Boeckl. Linnaea 40: 330. 1876, ex parte, non *C. viridis* Jungh.; *C. Pittieri* Boeckl. Allgem. Bot. Zeitschr. 2: 190. 1896 (type from Costa Rica). High mountains, 2,500–3,300 meters, sometimes in sphagnum bogs. Listed by Clarke under the names *C. Jamesonii* Boott and *C. pichinchensis* HBK.

**Carex Humboldtiana** Steud. Forests of the temperate region, 1,200–1,800 meters. Mexico and West Indies to northern South America.

**Carex Jovis** Clarke, Contr. U. S. Nat. Herb. 10: 470. 1908. Without locality, *Pittier & Tonduz 10757*.

**Carex Lemanniana** Boott. Higher mountains, at 2,000 meters or more. Southward to Ecuador. Reported from Costa Rica under the names *C. pichinchensis* HBK. and *C. Jamesonii* Boott.

**Carex polystachya** Swartz. *C. cladostachya* Wahl.; *C. acrolepis* Liebm. Dansk. Vid. Selsk. Skrivt. V. 2: 270. 1851 (type from Costa Rica); *C. Oerstedii* Liebm. op. cit. 272. 1851 (type from Costa Rica). Common in forests of the Meseta Central and on the higher mountains, 1,000–2,500 meters; region of San Ramón. Mexico and West Indies to northern South America. The most common species of *Carex* in Central America.

**Carex Purdiei** Boott. Forests of the higher mountains, 2,000–3,000 meters. Southward to Ecuador. A characteristic species of the paramos of Cerro de Las Vueltas, often growing with sphagnum.

## CYPERUS L.

The largest genus of Cyperaceae in tropical regions, well represented in Costa Rica as well as elsewhere in Central America.

**Cyperus alternifolius** L. An aquatic plant, originally from Madagascar, cultivated in gardens, especially in fountains. It is so similar to the native *C. canus* Presl that it is difficult to distinguish the two species in herbarium specimens.

**Cyperus amabilis** Vahl. Delta of Tsuritkub, *Tonduz 8606* (fide Kükenthal). Widely distributed in tropical and subtropical America and Africa. The Costa Rican collection is referred by Kükenthal to var. *macrostachyus* (Boeckl.) Kükenth.

**Cyperus articulatus** L. Common in the tierra caliente and perhaps in regions of greater elevation; growing in shallow water

or wet soil. Generally distributed in tropical regions of the earth. Easily recognized by its leafless, terete, spongy stems with numerous cross partitions.

**Cyperus canus** Presl. Tierra caliente. Extending to Mexico. In Salvador this species is cultivated commonly for its tough, somewhat spongy stems which are used for making the mats generally used as mattresses in Central America.

**Cyperus caracasanus** Kunth. *Mariscus flabelliformis* HBK.; *C. breviradiatus* Liebm. Dansk. Vid. Selsk. Skrivt. V. 2: 26. 1851. Common, especially on the coasts. Generally distributed in the tropics of America, Asia, and Africa.

**Cyperus chorisanthus** C. B. Clarke, Contr. U. S. Nat. Herb. 10: 449. 1908. Forests of Boruca, 460 meters, *Tonduz 4475*. Endemic.

**Cyperus compressus** L. Common in the tierra caliente. Widely distributed in warmer regions of both hemispheres.

**Cyperus cyperoides** (L.) Britton. *Mariscus Sieberianus* var. *evolutior* Clarke. Talamanca and El Rodeo de Pacaca, 900 meters. Central America, West Indies, and Old World.

**Cyperus diffusus** Vahl. Common in forests of the lowlands, often in banana plantations, at 1,200 meters or less. Warmer regions of both hemispheres. One of the most common Cyperaceae of Central America.

**Cyperus divergens** HBK. *C. asperrimus* Liebm. Dansk. Vid. Selsk. Skrivt. V. 2: 30. 1851; *Mariscus Manimae* Clarke. Cartago and other localities, 750–1,400 meters. Mexico to South America.

**Cyperus esculentus** L. A species of the coasts; Cocos Island. Widely distributed in both hemispheres.

**Cyperus ferax** L. Rich. *Torulinium confertum* Hamilt. Abundant in the tierra caliente, ascending to the Meseta Central. Pantropic in distribution. The most abundant species of the genus in Central America, growing profusely in cultivated ground.

**Cyperus flavescens** L. *Pycreus flavescens* Beauv. *C. Durandii* Boeckl. Allgem. Bot. Zeitschr. 1: 185. 1895 (type from San José). Common from the coasts to the Meseta Central (1,400 meters); La Hondura de San José. Tropical and temperate regions of both hemispheres.

**Cyperus Haenkei** Presl. *C. Pittieri* Boeckl. Allgem. Bot. Zeitschr. 2: 19. 1896 (Bahía de Salinas, *Tonduz 2711*); *Mariscus Haenkei* Presl. Growing on the coasts. Mexico and California.

**Cyperus haspan** L. Common in some regions, in wet soil at 1,300 meters or less. Warmer regions of both hemispheres.

**Cyperus hermaphroditus** (Jacq.) Standl. *Zacate jacintillo. Mariscus Jacquinii* HBK.; *M. dissitiflorus* Clarke; *C. Randuzii* var. *tenuis* Boeckl. Allgem. Bot. Zeitschr. 2: 17. 1896 (type from Costa Rica). Common in the Meseta Central and in coastal regions, at 1,400 meters or less. Mexico and West Indies to South America.

**Cyperus Humboldtianus** Schult. *Pycreus helvus* Clarke. Turrialba; Capulín; 0–500 meters. Central America.

**Cyperus imbricatus** Retz. *C. radiatus* Vahl. San Carlos, and probably in other regions. Warmer regions of both hemispheres.

**Cyperus incompletus** (Jacq.) Link. *Zacate jacintillo. Mariscus Mutisii* HBK.; *M. Ehrenbergianus* Clarke; *C. Randuzii* (*Tonduzii*) Boeckl. Allgem. Bot. Zeitschr. 2: 17. 1896 (San José, *Tonduz*). Meseta Central and coastal regions, at 1,400 meters or less. Widely distributed in tropical America.

**Cyperus lagunetto** Steud. *Pycreus lagunetto* Clarke. Meseta Central, 1,200–1,400 meters. Guatemala to South America.

**Cyperus lanceolatus** Poir. *C. Olfersianus* Kunth; *Pycreus propinquus* Nees. Cañas Gordas, at 1,100 meters. Widely distributed in tropical regions.

**Cyperus ligularis** L. *Mariscus rufus* HBK. Common on the coasts. Generally distributed in tropical America. A coarse, pale green plant, forming large clumps.

**Cyperus Luzulae** (L.) Retz. *Zacate estrella.* Common on the coasts. Widely distributed in tropical America.

**Cyperus macrolepis** Boeckl. Allgem. Bot. Zeitschr. 1: 226. 1895. Based upon Costa Rican material. Endemic.

**Cyperus Meyenianus** Kunth. Cartago, 1,400 meters. Mexico and West Indies to South America.

**Cyperus niger** Ruiz & Pavón. *C. melanostachyus* HBK.; *Pycreus melanostachyus* Clarke; *P. elegantulus* Clarke. Common in the Meseta Central and pastures of the volcanoes, 1,000–2,500 meters.

Southern California to South America. A small plant with nearly black spikelets.

**Cyperus nubigenus** Britt. & Standl. Journ. Wash. Acad. Sci. 15: 472. 1925. Las Nubes, Prov. San José, 1,900 meters, *Standley 38653*. Endemic.

**Cyperus piceus** Liebm. *C. piceus* f. *densior* Kükenth. Pflanzenreich IV. 20, Heft 101: 397. 1936 (Turrialba, *Tonduz 8266*). *C. piceus* f. *squalidus* Kükenth. loc. cit. *C. squalidus* Liebm. Vid. Selsk. Skrivt. Kjoebenhavn V. 2: 199. 1851 (San José, *Oersted 14399*). *C. Tonduzianus* Boeckl. Allgem. Bot. Zeitschr. 1: 187. 1895. Reported from San Francisco de Guadalupe. Mexico to Argentina.

**Cyperus polystachyos** Rottb. *C. inconspicuus* Liebm. Vid. Selsk. Skrivt. Kjoebenhavn 197. 1851 (San José, *Oersted 14392*). *C. Liebmanni* Steud. Syn. Cyp. 7. 1855. *C. fugax* Liebm. In sandy soil, Meseta Central to the coasts. Widely distributed in tropical regions.

**Cyperus prolixus** HBK. An aquatic plant, frequent in the Atlantic lowlands. Mexico to South America. Plants as much as 2 meters high, resembling the papyrus plant of the Nile.

**Cyperus rotundus** L. San José; Capulín; at 1,300 meters or less. Tropical regions of both hemispheres.

**Cyperus saturatus** Clarke, Bot. Jahrb. 37: 517. 1906. *Mariscus saturatus* Donn. Smith, Enum. Pl. Guat. 5: 89. 1899, nomen; Contr. U. S. Nat. Herb. 10: 453. 1902. *C. millifolius* Poepp. & Endl. var. *saturatus* Kükenth. Pflanzenreich IV. 20, Heft 101: 221. 1936. Jiménez, Llanuras de Santa Clara, *J. D. Smith 6839*. Also Tuis, at 600 meters. Ranging to Bolivia (fide Kükenthal).

**Cyperus simplex** HBK. Atlantic coast, at 300 meters or less. Mexico to northern South America.

**Cyperus spectabilis** Schreb. Cartago, 1,400 meters. Honduras and Mexico.

**Cyperus sphacelatus** Rottb. In the tierra caliente. Widely distributed in warmer regions of America and Africa.

**Cyperus surinamensis** Rottb. Common in the tierra caliente. Generally distributed in tropical America.

**Cyperus tenerrimus** Presl. *Botón de amor*. *C. cymbiformis* Liebm. Dansk. Vid. Selsk. Skrivt. V. 2: 20. 1851. Pacific coast,

usually growing in sand; Guanacaste; Cartago. Mexico to northern South America.

**Cyperus uncinatus** Poir. Meseta Central, 1,300 meters. Warmer regions of both hemispheres.

**Cyperus unioloides** R. Br. Meseta Central, 1,300 meters. Almost pantropic in distribution.

**Cyperus virens** Michx. *Junco.* Cartago; Cantón de Dota; 1,300–2,000 meters. United States to West Indies and South America.

### DICHROMENA Michx.

Small, low plants, the bracts subtending the spikelets usually white at the base.

**Dichromena ciliata** Vahl. Common from the Meseta Central to the coasts, at 1,400 meters or less. Generally distributed in tropical America.

**Dichromena radicans** Schlecht. & Cham. A common plant from the Meseta Central to the coasts, at 1,400 meters or less. Widely distributed in tropical America.

**Dichromena Watsoni** Britton. Atlantic coast. Guatemala to Panama.

### DIPLASIA L. Rich.

**Diplasia karataefolia** L. Rich. *Zacatón.* Lomas del Silencio, Valle de Diquís, 600 meters. A South American species, unknown elsewhere in North America. Cited by Clarke under the fantastic name of *Dulichium arundinaceum* (L.) Britton, which pertains to a very different plant of the United States.

### ELEOCHARIS R. Br.

Annual or perennial plants of wet soil, the leaves reduced to bladeless sheaths at the base of the stem, the stems terminated by a single spikelet.

**Eleocharis acicularis** (L.) R. Br. Volcán de Poás and Cerro de Las Vueltas, 2,500–3,000 meters, in sphagnum bogs or marshy places. Widely distributed in both hemispheres. A diminutive plant, only 3–15 cm. high.

**Eleocharis caribaea** (Rottb.) Blake. Common in many places, ascending to 1,800 meters. Tropics of both hemispheres. Reported by authors under the name *E. capitata* (L.) R. Br.

**Eleocharis Durandii** Boeckl. Allgem. Bot. Zeitschr. 2: 34. 1898. Buenos Aires, *Tonduz 4887*. Endemic.

**Eleocharis flaccida** (Reichenb.) Urban. *E. ochreata* Steud.; *E. Pittieri* Boeckl. Allgem. Bot. Zeitschr. 2: 35. 1896 (San José, *Pittier 548*). Meseta Central and slopes of the volcanoes, 1,200–2,000 meters. Tropics of both hemispheres. One collection listed by Clarke as *E. olivacea* Torr. is referable to this species.

**Eleocharis geniculata** (L.) R. Br. *Junco, Tule.* Abundant in many places, Meseta Central to the coasts. Generally distributed in tropical America. A stout plant as much as a meter high. In some parts of Costa Rica there are wet fields occupied almost exclusively by this plant, whose spongy stems are used in large quantities for making the thick mats that serve commonly for mattresses.

**Eleocharis interstincta** (Vahl) Roem. & Schult. *Junco.* Meadows of Volcán de Turrialba, 2,600 meters; Buenos Aires, 500 meters. United States to South America.

**Eleocharis minima** Kunth. Cañas Gordas, 1,100 meters. Widely distributed in tropical America.

**Eleocharis mutata** (L.) R. Br. Meseta Central. Widely distributed in tropical America. This species is utilized in the same manner as *E. geniculata.*

**Eleocharis nodulosa** (Roth) Schult. *Junco.* Meseta Central, and probably on the coasts; region of San Ramón. Widely dispersed in tropical America.

**Eleocharis pachystyla** (C. Wright) Clarke. Cañas Gordas, 1,100 meters. Cuba and northern South America. Unknown elsewhere in Central America.

**Eleocharis plicarrachis** (Griseb.) Svenson. *E. variegata* var. *laxiflora* Clarke. Buenos Aires, 200 meters. Tropical America.

**Eleocharis retroflexa** (Poir.) Urban. *E. chaetaria* Roem. & Schult. Abundant in wet places almost everywhere, at 1,800 meters or less. Tropics of both hemispheres.

**Eleocharis sulcata** (Roth) Nees. *E. costaricensis* Boeckl. Allgem. Bot. Zeitschr. 2: 34. 1896 (Boruca, *Tonduz 4637*); *E. purpureovaginata* Boeckl. loc. cit. (Buenos Aires, *Tonduz 4884*). Common in many regions, 300–1,200 meters. Mexico to South America.

### FIMBRISTYLIS Vahl

**Fimbristylis castanea** (Michx.) Vahl. Bahía de Salinas. United States and Mexico. Unknown elsewhere in Central America.

**Fimbristylis diphylla** (Retz.) Vahl. Abundant almost everywhere from the Meseta Central to the coasts. Tropics of both hemispheres. The common form of the species has an inflorescence of numerous spikelets, but there is another rare form in which it is reduced to a single spikelet, as in *Eleocharis*.

**Fimbristylis miliacea** (L.) Vahl. Common on the coasts. Pantropic in distribution. A small, annual plant.

**Fimbristylis monostachya** (L.) Hassk. Guanacaste, 250 meters, and probably in the savannas of other regions. Tropics of both hemispheres.

**Fimbristylis Preslii** Kunth. Nicoya. Guatemala to Colombia.

**Fimbristylis spadicea** (L.) Vahl. A halophilous plant growing in saline places along the seacoasts. Central America to West Indies and South America.

### FUIRENA Rottb.

**Fuirena umbellata** Rottb. Common on the Atlantic coast. Tropics of both hemispheres. Almost aquatic in habitat, growing usually in swampy places.

### HEMICARPHA Nees & Arn.

**Hemicarpha micrantha** (Vahl) Pax. Moist places of the coasts, growing most commonly in sandy, exposed stream beds (*arenales*). Tropical America and western Africa.

### HYPOLYTRUM L. Rich.

**Hypolytrum nicaraguense** Liebm. Cocos Island; probably also in swamps of the Atlantic coast. Central America to Brazil.

### KYLLINGA Rottb.

**Kyllinga brevifolia** Rottb. Meseta Central to the coasts, at 1,300 meters or less. Warmer regions of both hemispheres.

**Kyllinga nudiceps** Clarke ex Standl. Field Mus. Bot. 4: 199. 1929. Cocos Island, *Pittier 16272*. Endemic.

**Kyllinga odorata** Vahl. Meseta Central to the coasts, at 1,300 meters or less. Generally distributed in tropical America.

**Kyllinga peruviana** Lam. *K. vaginata* Lam. Atlantic coast, a halophilous plant of sea beaches. General in tropical America.

**Kyllinga pumila** Michx. Common almost everywhere, at 1,800 meters or less. Tropical America and Africa.

**Kyllinga pungens** Link. Atlantic coast; a halophilous plant of sea beaches. Widely distributed in tropics of both hemispheres.

### MAPANIA Aubl.

The genus is unknown elsewhere in Central America.

**Mapania pycnocephala** Benth. Carillo, 300 meters. Venezuela and Colombia.

**Mapania sylvatica** Aubl. Carillo, 300 meters. Ranging to Venezuela and the Guianas.

### RYNCHOSPORA Vahl

**Rynchospora aristata** Boeckl. Region of Cartago, 1,200–1,400 meters. Mexico and Jamaica to northern South America.

**Rynchospora armerioides** Presl. Buenos Aires, 480 meters. Extending to South America. A characteristic species of savannas.

**Rynchospora cephalotes** (L.) Vahl. Forests and thickets of the tierra caliente. Generally distributed in tropical America. Plants coarse, pale green, forming dense clumps.

**Rynchospora Clarkei** Rose. *R. Pringlei* Clarke. Savannas of Buenos Aires, 200 meters. Also in Panama and Mexico.

**Rynchospora corymbosa** (L.) Britton. *R. aurea* Vahl. Atlantic coast and Meseta Central, at 2,000 meters or less. Tropics of both hemispheres.

**Rynchospora cyperoides** (Swartz) Mart. Guanacaste; Buenos Aires; savannas, 500 meters or less. Tropical America and Africa.

**Rynchospora eximia** (Nees) Boeckl. This species was listed for Costa Rica by Clarke, but the specimen I have seen of the number cited (Boruca, *Tonduz 4479*) is *Fimbristylis diphylla*. The species inhabits wet savannas, and it is probable that it does grow in such places in Costa Rica. Mexico to Panama and Cuba.

**Rynchospora glauca** Vahl. Boruca; Buenos Aires; Páramos del Abejonal; Cantón de Dota; 200–2,900 meters, in savannas or sphagnum bogs. Tropics of both hemispheres. Cited by Clarke under the name *R. Schaffneri* Boeckl., a Mexican species probably synonymous with this.

**Rynchospora globosa** (HBK.) Roem. & Schult. San José and probably in other regions. Central America and Cuba to South America.

**Rynchospora hirsuta** Vahl. Savannas of Buenos Aires, 480 meters. Cuba and northern South America.

**Rynchospora locuples** Clarke, Bot. Jahrb. 34: Beibl. 78: 5. 1904. El Copey, 1,800 meters, *Tonduz 11919*. Also in Colombia.

**Rynchospora longispicata** Boeckl. Laguna de Buenos Aires, 200 meters. West Indies and South America. Unknown elsewhere in Central America.

**Rynchospora macrochaeta** Steud. Forests of the higher mountains, 2,000–3,000 meters. A South American species, elsewhere unknown in Central America.

**Rynchospora Marisculus** Nees. Ciénaga de Agua Buena; Cantón de Dota; 1,100–1,800 meters. Mexico and West Indies to South America.

**Rynchospora polyphylla** Vahl. *R. costaricensis* Boeckl. Allgem. Bot. Zeitschr. 2: 110. 1896. Meseta Central to the coasts, at 1,300 meters or less; Cocos Island. Widely distributed in tropical America.

**Rynchospora robusta** (Kunth) Boeckl. Ciénaga de Agua Buena, 1,100 meters, and probably in other regions. Southern Mexico to South America.

**Rynchospora Schiedeana** Kunth. *R. Schiedeana* subsp. *varica* Clarke, Contr. U. S. Nat. Herb. 10: 463. 1908 (El Copey, *Tonduz 11736*). Regions of Cartago and Dota, 1,300–1,800 meters. Mexico and Guatemala.

**Rynchospora Torresiana** Britt. & Standl. Journ. Wash. Acad. Sci. 15: 473. 1925. Forests of El Muñeco, Prov. Cartago, 1,400 meters, *Standley 33846*. Endemic. The species is named in honor of Professor Rubén Torres Rojas.

**Rynchospora vulcani** Boeckl. Linnaea 37: 638. 1873. *R. Pittieri* Boeckl. Allgem. Bot. Zeitschr. 2: 109. 1896. Volcán de Barba, *Hoffmann 66*. Slopes of the higher mountains, at 2,000–3,000 meters. Endemic.

## SCIRPUS L.

**Scirpus inundatus** (R. Br.) Poir. Higher mountains, at 2,000–2,800 meters. South America, Australia, and New Zealand. Not

known elsewhere in Central America. A small plant, growing in meadows of the volcanoes, often in sphagnum bogs; abundant about the crater of Poás.

Undoubtedly there will be found in Costa Rica *Scirpus cubensis* Kunth, a subaquatic plant that grows in many places along the Atlantic coast of Central America.

## SCLERIA Berg

Reference: Earl L. Core, The American species of *Scleria*, Brittonia 2: 1. 1936.

**Scleria arundinacea** Kunth. Atlantic coast, ascending to Pejivalle (900 meters); region of San Ramón. Central and South America.

**Scleria bracteata** Cav. *Navajuela.* Moist places of the coasts. Mexico to South America.

**Scleria coriacea** Liebm. Vid. Selsk. Skrivt. Kjoebenhavn V. 2: 259. 1850. Guanacaste, *Oersted.* Known only from the original collection. Reduced by the present writer incorrectly to synonymy under *S. setacea* Poir. Core states that it is too closely related to *S. ciliata* Michx.

**Scleria hirtella** Swartz. Guanacaste, San José, and probably in other regions. Widely distributed in tropical America; Africa. A characteristic plant of savannas. One collection listed by Clarke as *S. distans* Poir. belongs to this species.

**Scleria latifolia** Swartz. Río Sarapiquí, and probably throughout the Atlantic coast. Central America to Lesser Antilles and Venezuela.

**Scleria lithosperma** (L.) Swartz. Guanacaste, 250 meters. Tropical regions of both hemispheres. A slender plant of savannas.

**Scleria macrophylla** Presl. *S. paludosa* Poepp. & Kunth. Region of Buenos Aires, and almost certainly in other parts of the coasts. Mexico to Brazil and Bolivia.

**Scleria microcarpa** Nees. Guanacaste, *O. Jiménez 756;* reported as collected in El General by Skutch. Guatemala to Cuba and Paraguay.

**Scleria micrococca** (Liebm.) Steud. *S. Liebmanni* Steud. *S. costaricensis* Boeckl. Allgem. Bot. Zeitschr. 2: 157. 1896 (between

Térraba and Boruca, *Tonduz 4634*). Region of Boruca. Mexico to northern Brazil; Cuba. A plant of savannas.

**Scleria pterota** Presl. *S. Pittieri* Boeckl. Allgem. Bot. Zeitschr. 2: 159. 1896 (La Cruz, Guanacaste, *Pittier 2715*). Tierra caliente, at 500 meters or less. Mexico and West Indies to South America.

**Scleria pterota** var. **melaleuca** (Schlecht. & Cham.) Standl., var. nov. *Scleria melaleuca* Schlecht. & Cham. Common in forests of the coasts, ascending to 900 meters; region of San Ramón. Widely distributed in tropical America. The achenes of *S. pterota* are white or yellowish brown, those of var. *melaleuca* purplish or almost black. Since no other differences are apparent, it seems necessary to regard *S. melaleuca* as representing merely a variety, which, however, usually is constant and definitely recognizable.

**Scleria secans** (L.) Urban. *Navajuela. S. reflexa* HBK. Common in forests and thickets of the Atlantic tierra caliente. Sometimes scandent and as much as 3 meters long, forming impenetrable tangles in swamps and forests. The long leaves, with rough edges, cut the flesh almost like a knife.

**Scleria vaginata** Steud. *S. Tonduzii* Boeckl. Allgem. Bot. Zeitschr. 2: 160. 1896 (Valle de Tuis, *Tonduz 8181*). Also in Brazil, Peru, and Bolivia.

## STENOPHYLLUS Raf.

**Stenophyllus junciformis** (HBK.) Britton. *Bulbostylis junciformis* Kunth. Boruca and Buenos Aires, 300–500 meters. A plant of savannas. Mexico to West Indies and Uruguay.

**Stenophyllus paradoxus** (Spreng.) Standl. *Pelo de ratón* (Guanacaste). *Bulbostylis paradoxa* Kunth; *Rynchospora perrigida* Boeckl. Allgem. Bot. Zeitschr. 2: 93. 1896 (type from Costa Rica). Buenos Aires and Guanacaste. A plant of savannas and dry places; dwarf and forming very dense and large tufts of filiform leaves.

**Stenophyllus tenuifolius** (Rudge) Britton. Meseta Central to the Pacific coast, at 1,300 meters or less. Guatemala to South America.

## UNCINIA Pers.

Plants perennial, the flowers disposed in a single terminal spike.

**Uncinia hamata** (Swartz) Urban. *U. jamaicensis* Pers. Forests of the Meseta Central and slopes of the volcanoes, 1,300–3,300

meters; region of San Ramón. The achenes terminate in hooked bristles which adhere closely to clothing and penetrate the skin.

**Uncinia tenuis** Kunth. Volcán de Barba, 2,500 meters. An Andean species, unknown elsewhere in Central America.

## PALMAE. Palm Family

Reference: B. E. Dahlgren, Index of American palms, Bot. Ser. Field Mus. 14. 1936.

The number of palms native in Costa Rica is very large. They are one of the groups of plants most difficult of study, at least by ordinary methods, chiefly because of their stature, which makes it difficult or impossible to prepare adequate herbarium specimens of them. Only in genera composed of small plants, such as *Chamaedorea* and *Reinhardtia*, is it possible to prepare herbarium specimens that give some idea of the plant as it grows in nature. Thanks to recent publications by Burret, it is possible to present here a much more dependable account of Costa Rican palms than could have been offered five years ago. Their study has been facilitated enormously also by the recently published species index prepared by Dr. B. E. Dahlgren.

### ACROCOMIA Mart.

**Acrocomia vinifera** Oerst. Vid. Medd. Kjoebenhavn 1858: 47. 1859. *Coyol.* Based by Oersted upon plants seen on the Pacific slope of Costa Rica and Nicaragua. Nicaragua to Panama; and perhaps not distinct from the Mexican *A. mexicana* Karw. A palm as much as 8 meters or more in height, the trunk very thick, armed with long, black spines; leaves numerous, pinnate, very large, the dry ones persistent and hanging from the base of the green ones, densely spiny; spathes spiny, 1 meter long; spadices arising among the leaves, glabrous, densely branched; fruit globose, smooth, lustrous, 3.5 cm. thick. A characteristic palm of the savannas and dry slopes of the Pacific coast, where it often forms forests of large extent. Pittier states: "It was one of the economic plants of the ancient Indians, who obtained from its trunk a sap rich in sugar that they fermented to form one of the intoxicating drinks with which they enlivened their festivities. In times of scarcity, the fruits were eaten, and these are much enjoyed by cattle. Many of the larger *coyolares* of the Pacific coast have already disappeared." The name Coyol is of Aztec origin. Among local Indian names are: Será (Cabécara); U-krá, Ua-krá (Brunka); Zurí (Térraba).

## ASTEROGYNE Wendl.

The genus consists of two species, the other Colombian.

**Asterogyne Martiana** Wendl. *Geonoma trifurcata* Oerst. Vid. Medd. Kjoebenhavn 1858: 34. 1859. Wet forests of the Atlantic coast. Also in Nicaragua and Colombia. A dwarf palm, as much as 2 meters high, the trunk 4–5 cm. thick; leaves about 1 meter long, simple, bifid at the apex, 25 cm. wide; spadix with 3–6 branches 10–20 cm. long; fruits ellipsoid, purplish black, small, with one seed.

## ASTROCARYUM Mey.

Reference: Burret, Repert. Sp. Nov. 35: 114. 1934.

**Astrocaryum confertum** Wendl. ex Burret, Repert. Sp. Nov. 35: 136. 1934. *Coyolillo, Surubre* (Wendland). Río Sarapiquí, *Wendland.* Region of San Ramón. Growing (fide Pittier) in the tierra caliente of both coasts. Plants 2–3 meters high, the trunk armed with compressed and elongate spines; leaves pinnate, spiny; fruits globose, forming large, dense, pendent panicles. It may well be that more than one species of the genus exists in Costa Rica, but no specimens are at hand for determination of the matter.

## BACTRIS Jacq.

Reference: M. Burret, *Bactris* und verwandte Gattungen, Repert. Sp. Nov. 34: 167–253. 1933–34.

Low palms, the trunk usually slender, armed with very long and slender spines; leaves terminal or disposed along the trunk, pinnately parted, the segments numerous, narrow, often furnished with spines; spadix usually short and branched, the 2 spathes hard and armed with sharp spines; fruits subglobose, unarmed, with a single seed.—The palms of this genus are abundant almost everywhere in the lowlands, where they often form dense and impenetrable thickets. They are most plentiful in swampy regions or in places inundated for part of the year. It is probable that other species than those listed here occur in Costa Rica.

**Bactris caudata** Wendl. ex Hemsl. Biol. Centr. Amer. Bot. 3: 412. 1885, nomen; Burret, Repert. Sp. Nov. 34: 230. 1934. Río Sarapiquí, *Wendland.* Endemic. Leaf segments obovate-oblong, 27 cm. long, 10 cm. wide, acuminate; fruit 12 mm. long, 11 mm. broad.

**Bactris dasychaeta** Burret, Repert. Sp. Nov. 34: 215. 1934. Las Vueltas, Tucurrique, 700 meters, *Tonduz 13310.* Endemic.

Leaf segments about 40, linear, glabrous, with short spines on the margins, 30 cm. long, 2.5 cm. wide; spadix 4 cm. long, with numerous branches 5 cm. long; fruit 1.5 cm. long.

**Bactris fusca** Oerst. Vid. Medd. Kjoebenhavn 1858: 43. 1859; Amérique Centrale *pl. 8, f. 16–29.* Forests of Turrialba, 900 meters, *Oersted.* Endemic. Leaves 1 meter long, the segments linear, 20 cm. long, 1 cm. wide, pubescent beneath, armed with short, slender spines; spadix with 2–5 branches about 7 cm. long; drupe blackish.

**Bactris glandulosa** Oerst. Vid. Medd. Kjoebenhavn 1858: 184. 1859; Amér. Centr. *pl. 8, f. 1–15, pl. 9, f. 53; B. bifida* Oerst. Vid. Medd. Kjoebenhavn 1858: 44. 1859, non *B. bifida* Mart.; *B. Oerstediana* Traill, Journ. Bot. 15: 43. 1877. Forests of Turrialba, 900 meters, *Oersted.* Endemic. Leaves large, their segments linear, pale, 40 cm. long, 18 cm. wide, pubescent beneath, the margins armed with short spines; branches of the spadix 5–6 cm. long; spathe covered with long, slender, hair-like spines.

**Bactris gracilior** Burret, Repert. Sp. Nov. 34: 216. 1934. San Carlos, *Koschny* in 1901. Endemic. Leaf segments narrowly linear, 40 cm. long, 2 cm. wide, narrowly long-produced at the apex; branches of the spadix 15–18, slender, 5–6.5 cm. long; fruits 13 mm. long.

**Bactris longipetiolata** Wendl. ex Hemsl. Biol. Centr. Amer. Bot. 3: 412. 1885, nomen. Collected by Wendland on the Río Sarapiquí. No description of the species has been published.

**Bactris longiseta** Wendl. ex Burret, Repert. Sp. Nov. 34: 213. 1934. Pedregal and San Miguel, Río Sarapiquí, *Wendland.* Endemic. Leaf segments linear-lanceolate, 60 cm. long, 4–6.5 cm. wide, acuminate, the marginal spines as much as 2.5 cm. long; fruit 1.5 cm. long.

**Bactris minor** Jacq. *Huiscoyol. B. horrida* Oerst. Vid. Medd. Kjoebenhavn 1858: 414. 1859; Amér. Centr. *pl. 9, f. 50–52.* Pacific coast, in many places forming dense thickets of wide extent. Ranging to Venezuela. Stems slender, 2–3 meters high, forming dense colonies, armed with spines 7–10 cm. long; leaves 1 meter long, the segments 18 cm. long and 2 cm. wide, lanceolate; spathe tomentose, 25 cm. long, covered with short spines; spadix branches 20–22, about 8 cm. long; drupe violet-black. The fruits are edible, but their flesh is scant and not at all agreeable in flavor. In some parts of Costa Rica this palm furnishes one of the principal sources of

forage for cattle during the dry season. Pittier states that cattle soon learn how to bend down the stems in order to reach the leaves, but that in doing so they often destroy their eyes. The vernacular name is written also as Uizcoyol and Biscoyol; it is of Mexican origin. For this species there have been cited the following Indian names, which probably are applied also to other species: Surikkuo (Cabécara); Skub, Seró (Bribrí); Tsuakrá (Brunka); Shir (Térraba); Kóoki (Guatuso); Pisup (Rama).

**Bactris polystachya** Wendl. ex Hemsl. Biol. Centr. Amer. Bot. 3: 413. 1885, nomen nudum. Río Sarapiquí, *Wendland*. No description of this species has been published.

**Bactris Porschiana** Burret, Ann. Naturhist. Mus. Wien 229. 1933. La Castilla to Los Negritos, 12 km. from the mouth of Río Reventazón, *Cufodontis 724*. Endemic. A palm 10 meters high, with leaves 4 meters long.

**Bactris pubescens** Burret, Repert. Sp. Nov. 34: 197. 1934. *Huiscoyol, Coligallo*. San Carlos, *Koschny* in 1901. Wet forests of the Atlantic coast. Endemic. Leaves entire, bifid at the apex, about 50 cm. long, pubescent beneath; spathe densely covered with slender spines; fruit bright red; trunk 1–2 meters high.

**Bactris Standleyana** Burret, Repert. Sp. Nov. 34: 199. 1934. Wet forests, Tilarán, Guanacaste, *Standley & Valerio 44446*. Endemic. Stems slender, 1 meter high; leaves entire, bifid at the apex, the blade 38 cm. long, somewhat pubescent beneath; spathe covered with spines 1 cm. long; branches of the spadix 5, short; fruit 13 mm. long.

**Bactris Wendlandiana** Burret, Repert. Sp. Nov. 34: 198. 1934. *B. obovata* Wendl. in Kerchov. Palm. 234. 1878, nomen; *B. villosa* Wendl. ex Hemsl. Biol. Centr. Amer. Bot. 3: 413. 1885, nomen. Sarapiquí, *Wendland*. Endemic. Leaves with elongate petioles, the blade simple, bifid at the apex, 60 cm. long, pubescent on both surfaces; spadix small, 6 cm. long, the branches about 22 and 5 cm. long; fruit 12 mm. long.

## CALYPTROGYNE Wendl.

Reference: M. Burret, Bot. Jahrb. 63: 131–140. 1930.

Low, unarmed palms, the trunk very short or none; leaves pinnatisect, green; spadix simple in the Costa Rican species, the flowers sunk in pits in the rachis; fruits very small, with a single seed.

**Calyptrogyne glauca** (Oerst.) Wendl. in Kerchov. Palm. 238. 1878. *Geonoma glauca* Oerst. Vid. Medd. Kjoebenhavn 1858: 35. 1859; *G. spicigera* K. Koch, Wochenschr. 244. 1858; *C. spicigera* Wendl. Bot. Zeit. 17: 72. 1859. Type collected by Oersted in Nicaragua, along the Río San Juan, and doubtless occurring also in Costa Rica. Leaves 1.3 meters long, 50 cm. wide, the segments 4–12, about 2 cm. wide; spadix as much as 30 cm. long, 1 cm. thick, glabrous; fruits purple-black, 12 mm. long.

**Calyptrogyne sarapiquensis** Wendl. in Kerchov. Palm. 238. 1878, nomen; Burret, Bot. Jahrb. 63: 134. 1930. *Cola de gallo, Coligallo, Siuta.* Río Sarapiquí, between La Virgen and Pedregal, *Wendland.* Region of San Ramón and in Guanacaste. Endemic. Trunk as much as 2 meters in height; leaves 1.5–2 meters long, 60–70 cm. wide, dark green, the segments 10–30; spadix 40–50 cm. long, glabrous, the flowers arranged in 8 ranks. The palms of this genus often form wide and dense colonies in the wet or swampy forests of the northern lowlands. The leaves are used by the coast people for covering the roofs and sides of their houses. The name Coligallo is a contraction of Cola de gallo. Pittier reports the Brunka name as Saat-krá, the Térraba name as Shró-nemo.

**Calyptrogyne trichostachys** Burret, Bot. Jahrb. 63: 135. 1930. San Carlos, *Koschny.* A common species of forests of the Atlantic coast. Endemic. Leaves paler on the lower surface, the blade 1 meter long; spadix 30 cm. long, 7–12 mm. thick, densely pilose; fruit obovoid-oblong, 9 mm. long.

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In parks and fincas there are often cultivated, under the name Cola de pescado, *Caryota mitis* Lour. and *C. urens* L., natives of Asia and the East Indies. They are tall and handsome palms, their leaves twice pinnatisect, with very numerous wedge-shaped segments.

## CHAMAEDOREA Willd.

Reference: M. Burret, *Chamaedorea* Willd. und verwandte Palmengattungen, Notizbl. Bot. Gart. Berlin 11: 724–768. 1933.

Dwarf palms with slender, smooth, unarmed stems; leaves commonly pinnatisect, sometimes simple, inserted along the upper part of the stem; spadices in most species branched, sometimes simple, enclosed before anthesis in a few green spathes that resemble corn husks; flowers dioecious; fruits globose or oblong, black at maturity, with a single seed.—The species of *Chamaedorea* are elegant and

ornamental plants, and often are planted in Central American gardens. They are known by the name Pacaya, which is given probably to all the species, most of which are much alike in general appearance. The young and tender inflorescences are commonly used as a vegetable, being fried with eggs or prepared in various other manners. They have a somewhat bitter flavor that is at the same time altogether agreeable. In some species, however, the spadices are so intensely bitter that they can not be eaten. It is said that the young leaves likewise are sometimes eaten. Among the Central American Chamaedoreas are several of the smallest palms known, the plants producing flowers in some instances when only 30 cm. in height.

Among Indian names cited for this genus are: Sor (Cabécara); Tsepa, Huko (Bribrí); Shrongo (Térraba); Kerar (Cabécara); Kabú (Bribrí); Kue-tiki-tashía (Guatuso); Kúktik, Kóktik, Kokti-gistashi (Guatuso); Yab, Iyab (Bribrí); Iyabu (Cabécara); Hodchuc (Estrella); Hechuc (Chirripó); Caratepú (Tucurrique); Shoc (Térraba); Cuh (Boruca).

**Chamaedorea amabilis** Wendl. ex Dammer, Gard. Chron. 36: 254. 1904. *Nunnezharoa amabilis* Kuntze, Rev. Gen. 731. 1891. Near San Miguel, Río Sarapiquí, *Wendland*. Wet forests of the Atlantic coast and mountains of Guanacaste, at 750 meters or less; region of San Ramón. Stems slender, 1–2 meters high; leaf blades 25–30 cm. long, 13–17 cm. wide, deeply bifid; spadix with 2 or more slender branches, the flowers dense or remote. Endemic.

**Chamaedorea Arenbergiana** Wendl. *Pacaya*. Region south of Cartago and slopes of Volcán de Barba, at 1,400–2,000 meters. Extending to Guatemala. Stems slender, green, 1–1.5 meters high; leaves pinnatisect, the numerous segments lanceolate, conspicuously nerved; pistillate spadix simple, very dense; fruits black, broadly oblong.

**Chamaedorea bifurcata** Oerst. Vid. Medd. Kjoebenhavn 1858: 13. 1859. *Pacaya*. *Nunnezharoa bifurcata* Kuntze, Rev. Gen. 730. 1891. Aguacate, *Oersted*. Collected also at Santa Rosa de Copey, at 1,800 meters. Endemic. A small plant, the caudex procumbent, 30 cm. long; leaves pinnate, 45–60 cm. long, the segments 8, lanceolate, 15 cm. long; pistillate spadix 20 cm. long, bifurcate; spathes 5. This species is not represented in the numerous collections of the genus made by the writer, hence it is to be inferred that it is a rare plant.

**Chamaedorea costaricana** Oerst. Vid. Medd. Kjoebenhavn 1858: 19. 1859. *Pacaya. Nunnezharoa costaricana* Kuntze, Rev. Gen. 730. 1891; *C. Biolleyi* Guillaumin, Bull. Mus. Hist. Nat. Paris 28: 543. 1922 (temperate region, *Biolley*). Turrialba, 900–1,200 meters, *Oersted.* An abundant plant of the valley of the Reventazón and wet forests of Guanacaste, at 500–2,000 meters. Endemic. Stems slender, green, 1–3 meters high; leaves pinnate, the segments as many as 40, linear-lanceolate, few-nerved; staminate spadix 40 cm. long or more, simply branched, the branches slender, 10–25 and 10–25 cm. long; pistillate spadix with few or numerous branches; fruits globose.

**Chamaedorea Dammeriana** Burret, Notizbl. Bot. Gart. Berlin 11: 737. 1933. San Carlos, *Koschny.* San Carlos; mountains of Guanacaste, ascending to 700 meters. Endemic. Stems slender, 1 meter high; leaves simple, small, bifurcate or pinnatisect; pistillate spadix simple, 20 cm. long, very slender, the flowers remote.

**Chamaedorea exorrhiza** Wendl. ex Guillaumin, Bull. Mus. Hist. Nat. Paris 28: 542. 1922. *Pacaya, Pacaya de danta.* San Miguel, Río Sarapiquí, *Wendland.* Plants growing in the region of San Ramón and on both slopes of the mountains of Tilarán are perhaps referable here, although this is not certain. Stem erect, 1.5–2.5 meters high, 3.5–4 cm. thick; leaves few, 75–100 cm. long, with as many as 40 lanceolate segments, their nerves very conspicuous and elevated; staminate spadix 25 cm. long, simply branched, with about 40 branches; fruits black, obovoid, 15–18 mm. long.

**Chamaedorea geonomaeformis** Wendl. Region of San Ramón. Ranging to Guatemala. Stems slender, 1.5 meters high or less; leaves simple, commonly about 30 cm. long, deeply bifid at the apex, the lobes acute or acuminate; fruiting spadix simple, long and slender, the rachis orange or bright red; fruit globose, scarcely 1 cm. in diameter, black.

**Chamaedorea graminifolia** Wendl. *Pacaya.* Wet forests of the Atlantic slope. Extending to Guatemala. Stems slender, green, 1.5–4 meters high; leaves large, divided into numerous linear segments; spadices pendent, with numerous elongate, tortuous branches; rachis orange-colored after anthesis; fruits oblong, black. The leaf segments are much narrower than those of other species.

**Chamaedorea macrospadix** Oerst. Vid. Medd. Kjoebenhavn 1858: 20. 1859. *Pacaya. Nunnezharoa macrospadix* Kuntze, Rev. Gen. 730. 1891. Forests of Turrialba, 900–1,200 meters, *Oersted.*

Atlantic slope; reported from El General. Endemic. Caudex short or none; leaf blade 60 cm. long, the 20–24 segments narrowly lanceolate, acuminate; staminate spadices elongate, almost equaling the leaves, the peduncle almost a meter long, the branches 21–26, very slender; spathes 6–7 and 25–30 cm. long. Sometimes cultivated in gardens of the Meseta Central.

**Chamaedorea microphylla** Wendl. Region south of Cartago and slopes of Volcán de Poás; region of San Ramón; 900–1,900 meters. Described from Chiriquí, Panama. A dwarf palm, the stem very short or none; leaves small, the numerous segments 7–10 cm. long, 3-nerved; pistillate spadix small, with few short branches; fruits globose, blackish.

**Chamaedorea nana** N. E. Brown, Kew Bull. 156. 1914; Bot. Mag. *pl. 8652*. *Kinetostigma nana* Burret, Notizbl. Bot. Gart. Berlin 11: 318. 1932. Based upon a Costa Rican plant cultivated in the Kew Gardens, London. Collected also at Tucurrique, at 800 meters. Endemic. Plants 30–60 cm. high, acaulescent, the rhizome creeping; leaves about 10, the petioles as much as 13 cm. long; blade obovate, bifid almost to the middle, 23 cm. long; spadix simple, glabrous, axillary, 20 cm. long, the flower spikes 8 cm. long; fruits small, globose, black. A species close to *C. pumila*, and perhaps not distinct.

**Chamaedorea Pacaya** Oerst. Vid. Medd. Kjoebenhavn 1858: 12. 1859. *Pacaya*. *Nunnezharoa Pacaya* Kuntze, Rev. Gen. 730. 1891. Jarís, 900 meters, *Oersted*. Wet forests, Atlantic coast to the Meseta Central; slopes of Volcán de Poás; San Ramón; mountains of Guanacaste; Cantón de Dota; at 300–2,000 meters. Ranging to Honduras. Stems slender, 1–3 meters high; leaves pinnate, 60–90 cm. long, the segments about 14, oblong-lanceolate or narrower, 15–20 cm. long; spathes 5–6; rachis of the pistillate spadix 2.5–3.5 cm. long, the 5 or 6 branches 7–10 cm. long, rather stout, sometimes erect; fruits 8–10 mm. in diameter, globose, black.

**Chamaedorea parvifolia** Burret, Notizbl. Bot. Gart. Berlin 11: 746. 1933. *Pacaya*. Cerros de Velirla, Copey, 2,600–2,700 meters, *Tonduz 11794*. A common palm of the oak (*Quercus*) forests of Cantón de Dota, 1,500–1,700 meters; region of San Ramón. Endemic. Stems 2 meters high or less, sometimes almost none, green; leaves small, the 8–10 segments lanceolate, 16 cm. long; pistillate spadix with 3–5 slender branches 7–8 cm. long, the rachis orange-colored or reddish; fruits small, globose, black.

**Chamaedorea pumila** Wendl. ex Dammer, Gard. Chron. 36: 246. 1904. *Nunnezharoa pumila* Kuntze, Rev. Gen. 731. 1891. San Miguel, Sarapiquí, *Wendland.* Atlantic coast and mountains of Tilarán, Guanacaste; San Ramón; ascending to 850 meters. Endemic. A dwarf plant, acaulescent or with a procumbent caudex; leaves 6–8, very shortly petiolate, 20–45 cm. long, bifid at the apex, thick, the nerves numerous and elevated; pistillate spadix short, simple. A handsome plant, especially because of the thick texture of its leaves, which are very different from those of other species.

**Chamaedorea rhombea** Burret, Notizbl. Bot. Gart. Berlin 11: 753. 1933. Rancho de Achiote, southern slope of Volcán de Poás, 2,250 meters, *Pittier 374.* Endemic. Stem 1 cm. thick; petiole 24 cm. long, the rachis of the blade 42 cm. long, the segments 10, ovate-rhombic, acuminate, 6.5–9 cm. long; spadix branches 3–4 and 6–7 cm. long; fruits subobovoid. Related to *C. Pacaya,* from which it may not be distinct.

**Chamaedorea Warscewiczii** Wendl. Forests of Tucurrique, 700 meters. Also in Guatemala. Leaves pinnatisect, the segments rhombic-sigmoid, acuminate; spadix simply branched.

## COCOS L. Coconut

**Cocos nucifera** L. *Cocotero.* This, the best known of all palms, grows abundantly upon the sea beaches, and is seen in cultivation in almost every part of the country, except in the colder regions. Perhaps the most handsome and certainly the most picturesque of all palms, it forms an essential element of almost every scene in the tierra caliente. Notwithstanding its present abundance, the coconut is not a native of Costa Rica, but it is not known whether it existed here before the advent of the Spaniards. The fruits have been exported from Costa Rica upon a small scale. The meat is employed locally for preparation of different kinds of sweetmeats, and from the *pipas*—young and tender fruits—is obtained a refreshing beverage that has the advantage of being always cool, no matter how hot the air may be. Pittier states that the variety of coconut found on Cocos Island has a depressed nut smaller than that of continental trees. Among the Indian names cited are: Kuku (Cabécara, Bribrí); Sia-krá (Brunka); Koko (Térraba); Igvá (Talamanca); Si-agua (Boruca).

## COROZO Giseke

**Corozo oleifera** (HBK.) L. H. Bailey. *Coquito, Palmiche* (Nicoya). *Elaeis melanococca* var. *semicircularis* Oerst. Vid. Medd.

Kjoebenhavn 1858: 51. 1859 (Palmar, *Oersted*). Swampy places near the sea, on both coasts. An almost unarmed palm, the trunk large and very thick, procumbent, the erect portion 1.5–3 meters high, covered in part by persistent bases of dead leaves; leaves very large, the blade 3 meters long or more, the very numerous segments a meter long; petiole armed with sharp, incurved spines; fruits resembling small, red coconuts, arranged in large, dense, cone-like panicles almost concealed in the axils of the leaves. This palm has been listed commonly under the name of *Elaeis melanococca* Gaertn. From the seeds there is extracted an oil that is highly esteemed by the people of the coast, but only small amounts of it are obtained. The species ranges southward to Venezuela.

## CRYOSOPHILA Blume

Reference: H. H. Bartlett, Carnegie Inst. Wash. Publ. 461: 37. 1935.

Tall palms armed with elongate, not very sharp spines that probably represent adventitious roots, the trunk provided near the base with aerial roots; leaves rounded, fan-like, bifid to the base, the rachis almost none, the blades 1.5–2 meters long, pale and silvery beneath; petioles 1–2 meters long, with numerous fibers at the base; fruits obovoid or oblong, 2–2.5 cm. long.—The genus consists of four Mexican and Central American species. The leaves are used for making coarse brooms.

**Cryosophila albida** Bartlett, Carnegie Inst. Wash. Publ. 461: 40. 1935. *Guagra, Palmera de escoba.* Plains of Santa Clara, 100 meters, *Cook & Doyle 74.* Probably frequent in the Atlantic tierra caliente. Also in Panama. Leaves not lustrous on the upper surface; spadix amply paniculate. For this species, referred previously by some authors to *Acanthorrhiza Warscewiczii* Wendl., a species of Panama, there are reported the following Indian names: Shkuá (Cabécara); Tus (Bribrí); Kin-gó (Térraba); Suurun, Báoka (Guatuso).

*Cryosophila Warscewiczii,* like numerous other palms of southern Central America, is illustrated by L. H. Bailey in his pamphlet *Certain palms of Panama,* in volume 3 of *Gentes Herbarum* (1933). This publication, with its numerous fine illustrations, is the most useful one available for those who desire to become acquainted with the palms of Central America.

**Cryosophila Cookii** Bartlett, Carnegie Inst. Wash. Publ. 461: 39. 1935. Río Hondo, plains of Santa Clara, 100 meters, *Cook*

*& Doyle 635*. Endemic. Leaves very lustrous on the upper surface; spadix narrow, with very short, simple branches.

## DASYSTACHYS Oerst.

The genus consists of only the following species.

**Dasystachys Deckeriana** (Klotzsch) Oerst. *Coligallo*. Atlantic slope; collected at San Miguel, Río Sarapiquí, and at Tuis; Pejivalle, at 900 meters. Also in Guatemala. A dwarf palm, the stem short, erect; leaves simple, bifid at the apex, petiolate; spadices simple, arising between or below the leaves, the peduncle elongate, the flowers 8-ranked; stigmas 3, recurved, exserted. The species is illustrated by Oersted, Amér. Centrale *pl. 6*. In general appearance it resembles a *Chamaedorea*.

## DESMONCUS Mart.

**Desmoncus costaricensis** (Kuntze) Burret, Repert. Sp. Nov. 36: 202. 1934. *Matamba*. *Atitara costaricensis* Kuntze, Rev. Gen. 726. 1891. Mountains south of San José, *Kuntze*. Abundant in all the tierra caliente. Endemic. A large vine, the slender stems armed with blackish spines; leaves pinnate, the segments spiny near the base; terminal part of the rachis without segments but with pairs of stout, refracted, very sharp spines, the terminal portion of the rachis long and whip-like; fruits arranged in large panicles. The flexible stems are employed in Nicoya for making baskets. The vines of this genus form impenetrable thickets in some places along the Atlantic coast, where they are a constant menace to travelers through the forest, particularly because of the danger of injuring one's eyes with the sharp spines, which often dangle across the trails and are not at all conspicuous. The plant has been reported from Costa Rica under the name *D. oxyacanthos* Mart. Indian names listed are Tsua-krá (Brunka) and Shir (Térraba).

**Desmoncus leptochaeta** Burret, Repert. Sp. Nov. 36: 204. 1934. *Matamba*. Río Abrojo, Pacific plains, *Pittier 11969*. Endemic. Judging from Burret's description, the plant is very similar to the preceding species.

## EUTERPE Gaertn.

Reference: M. Burret, Die Gattung *Euterpe* Gaertn., Bot. Jahrb. 63: 49–76. 1929.

Tall, solitary palms, the trunk slender and unarmed; leaves terminal, pinnatisect, the segments narrow and acuminate; spadix a branched panicle; fruits very small, with a single seed.

**Euterpe brachyspatha** Burret, Bot. Jahrb. 53: 56. 1929. Cañas Gordas, 1,100 meters, *Pittier 11124*. Endemic. Leaves with about 34 segments, these 35–50 cm. long, 1–2 cm. wide, green on both sides; spadix 1 meter long, the branched portion only 20 cm. long; spathe shorter than the peduncle; spadix branches glabrous; fruits 7 mm. long.

**Euterpe decurrens** Wendl. in Kerchov. Palm. 244. 1878, nomen; Burret, Bot. Jahrb. 63: 63. 1929. Type collected in San Carlos by Koschny in 1901. Collected at San Miguel by Wendland. Endemic. Leaf segments 65 cm. long, 3 cm. wide; spadix branches 50 cm. long, pubescent; fruits 8 mm. long.

**Euterpe longipetiolata** Oerst. Vid. Medd. Kjoebenhavn 1858: 32. 1859. *Palmito, Pacaya de ratón.* Near Turrialba, 1,000 meters, *Oersted*. Collected at Tucurrique (635 meters) by Tonduz, and probably common on the Atlantic slope. A tall palm, the leaves 2.5–3 meters long, the 40–50 segments 45–60 cm. long, linear-lanceolate; spathe 75 cm. long, equaling the spadix; spadix branches 40–60 cm. long, glabrous The terminal bud or cabbage of this and other species is a delicious vegetable, much liked by all who are acquainted with it. All the species of *Euterpe* are much alike in general appearance, and it is probable that all bear the same local names. Among Indian names reported for this species are: Kerar-tebu (Cabécara); Shin-krá (Brunka); Sherebó (Térraba); Si, Sí-tebu (Cabécara).

**Euterpe microspadix** Oerst. Vid. Medd. Kjoebenhavn 1858: 31. 1859. Type collected by Oersted in Nicaragua, on the Río San Juan near Sarapiquí, and almost certainly to be found in Costa Rica. Material from Los Angeles de San Ramón probably is referable here. Trunk 15–25 meters high; leaves 2–2.5 meters long, with 70–80 segments; inner spathe 90 cm. long; branches of the spadix pubescent, 45 cm. long.

## GEONOMA Willd.

Reference: M. Burret, Bot. Jahrb. 63: 144–270. 1930.

Unarmed palms, dwarf or barely of medium size; leaves relatively small, entire or pinnatisect; spadix simple or branched, the flowers sunk in its branches; fruits small, globose, with a single seed.—One of the largest genera of the family, with 170 American species.

**Geonoma binervia** Oerst. Vid. Medd. Kjoebenhavn 1858: 33. 1859. *Súrtuba.* Type collected by Oersted on the Río San Juan in Nicaragua. Common in wet forests of the Atlantic coast. Extending to Guatemala. Trunk smooth, pale, 1.5–4.5 meters high; leaves large, pinnatisect, the narrow segments numerous; spadix pubescent, twice branched, reddish; fruits 1 cm. long. The tender, young spadices are eaten in some parts of Central America. This is an exceptionally handsome palm because of its neat and graceful form.

**Geonoma congesta** Wendl. ex Spruce, Journ. Linn. Soc. 11: 112. 1872. *Caña de danta.* Río Sarapiquí, between Pedregal and San Miguel, *Wendland.* Endemic. Forming small colonies, the trunk 4–5 meters high, 25 cm. thick, smooth, yellowish green; leaf rachis 90 cm. long, with 10 segments; spadix with 7–10 branches, the lower ones sometimes bifurcate, the flowers 6–8-ranked; fruit 7–8 mm. long.

**Geonoma cuneata** Wendl. ex Spruce, Journ. Linn. Soc. 11: 104. 1871. Río Sarapiquí, between Cariblanco and San Miguel, *Wendland.* Wet forests of the Atlantic coast. Endemic. Trunk 50 cm. high and 3–4 cm. thick; leaves 1 meter long, with 4–16 segments; spathes 20–30 cm. long; spadix simple, 20–30 cm. long, the flowers in 8–10 ranks; fruits 7 mm. thick.

**Geonoma decurrens** Wendl. ex Burret, Bot. Jahrb. 63: 162. 1930. El Muelle, Río Sarapiquí, *Wendland.* Endemic. Trunk 50 cm. high, 3–4 cm. thick; leaves 1.5 meters long, entire, bifid; spathe 12–17 cm. long; spadix simple, 22–27 cm. long, the flowers in 8 ranks.

**Geonoma edulis** Wendl. ex Spruce, Journ. Linn. Soc. 11: 106. 1871. *Súrtuba.* Above Turrialba, *Wendland.* Endemic. A tall palm, the trunk 6–10 meters high, 5–6 cm. thick, smooth; leaves almost erect, 3–4 meters long, pinnatisect, with about 40 segments; spathes 20 cm. long; spadix 50–60 cm. long, the branches about 20, again branched. The terminal buds or cabbages are eaten commonly as a vegetable, and are sold in quantity in the markets of the Meseta Central. The species is probably a common one on the Atlantic slope.

**Geonoma ferruginea** Wendl. ex Spruce, Journ. Linn. Soc. 11: 110. 1871. Above Cariblanco, Río Sarapiquí, *Wendland.* Endemic. Forests of the Atlantic coast; San Ramón; at 850 meters or less. Endemic. A palm forming small colonies, the trunk 2–4 meters high; leaves 4–6, about 1 meter long, covered with a brownish wool,

with 6 segments; rachis of the spadix 6 cm. long, with 8 or 9 simple branches 12–18 cm. long.

**Geonoma flaccida** Wendl. in Kerchov. Palm. 245. 1878, nomen nudum. Río Sarapiquí, *Wendland.* No description has been published of this species, which was listed by Hemsley also from Guatemala.

**Geonoma gracilis** Wendl. ex Spruce, Journ. Linn. Soc. 11: 105. 1871. *Pacaya de caballo.* Pedregal, Río Sarapiquí, *Wendland.* Region of San Ramón, at 1,100 meters. Endemic. Trunk 50–100 cm. high, 1–2 cm. thick; leaves 60 cm. long, with 6 segments; spathes 13–20 cm. long; spadix simple, 10–14 cm. long, the flowers arranged in 5–6 ranks.

**Geonoma Hoffmanniana** Wendl. ex Spruce, Journ. Linn. Soc. 11: 106. 1871. Volcán de Barba and Desengaño, 3,000 meters, *Wendland.* Wet forests of Barba and Poás; El Copey; 1,800–3,000 meters. Endemic. A dwarf palm, the trunk as thick as a finger; leaves 1 meter long, with 8–10 segments; spathes 25 cm. long; rachis of the spadix 5–7 cm. long, the 4–6 branches simple, 15–20 cm. long.

**Geonoma longipetiolata** Oerst. Vid. Medd. Kjoebenhavn 1858: 36. 1859. Type collected by Oersted in Nicaragua, along the Río San Juan. Wet forests of the Atlantic coast. Plants forming small colonies, the trunk 3–5 meters high, 2–2.5 cm. thick; leaves 1.5 meters long, with 8–16 segments; rachis of the spadix 15–17 cm. long, the branches 12–14, the lower ones again branched; fruits 6 mm. in diameter. *G. flaccida* Wendl. is perhaps a synonym of this species.

**Geonoma longevaginata** Wendl. ex Spruce, Journ. Linn. Soc. 11: 109. 1871. Río Sarapiquí, between La Virgen and Pedregal, *Wendland.* Endemic. An elegant palm, forming colonies, the trunk 3–5 meters high, 3–3.5 cm. thick; leaves 2–2.5 meters long, with 12–16 segments; spathes 12 cm. long; spadix twice branched, the rachis 15–23 cm. long, with 9–11 branches, the flowers in 7–8 ranks.

**Geonoma microspadix** Wendl. ex Spruce, Journ. Linn. Soc. 11: 110. 1871. Río Sarapiquí, *Wendland.* Listed by Hemsley also from Nicaragua. A little known plant, placed by Burret among the doubtful species.

**Geonoma microstachys** Wendl. ex Burret, Bot. Jahrb. 63: 228. 1930. San Miguel, Río Sarapiquí, *Wendland.* Also in Nicaragua. A dwarf palm, forming colonies, the trunk 2–3 meters tall, 2–2.5 cm.

thick; leaves 80–90 cm. long, the 6–12 segments widely separated, 20–30 cm. long; spadix twice branched, the rachis 8–10 cm. long; fruits 4–5 mm. thick. The fruits are eaten in Nicaragua, where the plant is known by the name Coyolito.

**Geonoma obovata** Wendl. ex Spruce, Journ. Linn. Soc. 11: 104. 1871. Pedregal, Río Sarapiquí, *Wendland*. Atlantic coast. Endemic. A dwarf palm, the trunks solitary, 50 cm. high, 1.5–2 cm. thick; leaves 1 meter long, simple or more or less parted, 20–25 cm. wide; spadix simple, 10–20 cm. long, the flowers in 7–8 ranks.

**Geonoma oxycarpa** Mart. Reported by Burret from the Atlantic coast. Also in Mexico, Guatemala, and Haiti. Leaves with 6 segments; spadix twice branched.

**Geonoma procumbens** Wendl. ex Spruce, Journ. Linn. Soc. 11: 105. 1871. Near San Miguel, Río Sarapiquí, *Wendland*. Plains of the Atlantic coast. Endemic. Trunk as much as 2 meters high, 3–5 cm. thick; leaves almost 2 meters long, the 12–16 segments lanceolate; inner spathes 50–70 cm. long; spadix simple, 30–50 cm. long, the flowers in 10–11 ranks.

**Geonoma versiformis** Wendl. ex Spruce, Journ. Linn. Soc. 11: 109. 1871. Above Turrialba, *Wendland*. Plains of the Atlantic coast. Endemic. Forming dense clumps 3–4 meters high, the trunk 1.5–2 cm. in diameter; leaves 1–1.5 meters long, with 5–15 segments; spathes 20 cm. long; rachis of the spadix 5–9 cm. long, the 8–10 branches simple, 8–17 cm. long, the flowers in 6 ranks.

## GUILIELMA Mart.

**Guilielma utilis** Oerst. Vid. Medd. Kjoebenhavn 1858: 46. 1859. *Pejibaye*. *Bactris utilis* Benth. & Hook. ex Hemsl. Biol. Centr. Amer. Bot. 3: 413. 1885. With regard to this palm, so well known in Costa Rica, one can not do better than cite Pittier's words: "An arborescent palm of the tierra caliente, where it is more abundant on the Atlantic side. The Indians cultivated it from the most remote times, and it is unknown in a truly wild state, for its occurrence in remote places is an indication of former settlements there. The trunk reaches a height of 8 meters, and is covered with slender, sharp spines, arranged in circular bands. The leaves are pinnatifid, and dark green. The yellow flowers, much frequented by Hymenoptera, form short racemes that are protected by a spiny spathe. The fruits are as large as a *jocote tronador*, and are bright red in one variety,

yellow in the other. The nut is surrounded by a sweet, mealy pulp that is eaten when cooked; its flavor suggests that of chestnuts, and it is a favorite food of the common people. The very hard wood was employed by the Indians for staffs, bows, arrow points, etc. The word Pejibaye is probably of South American origin, with the variants Pejiballe, Pijibay, Pixbae, and Pixbay."

The species *G. utilis* is known only from Costa Rica, but it may not be really distinct from *G. Gasipaes* (HBK.) L. H. Bailey, which ranges from Colombia to Brazil, and is known in many regions by the name Chonta. I believe that a palm I have seen on the Atlantic coast of Costa Rica—it is reported also elsewhere—where it is called Chonta, is nothing more than a wild or naturalized form of the pejibaye. Its bark, removed in a single piece and flattened out, with the spines removed, is employed for making the bottoms of beds or bunks in some of the country huts. The pejibaye, whose fruits are usually highly esteemed by visitors to Costa Rica, has been carried to other parts of Central America, where it thrives, but it is not common outside Costa Rica. To the writer it seems probable that the palm was brought to Costa Rica from South America by the Indians of the coasts, perhaps many centuries ago. Especially probable is this hypothesis if, as Pittier claims, the tree is not wild anywhere in the country.

Indian names reported for this palm are; Diká (Cabécara); Dikó (Bribrí); Suba-krá (Brunka); Shup (Térraba); Súuma (Guatuso); Supa (Rama).

### IRIARTEA Ruiz & Pavón

**Iriartea gigantea** Wendl. ex Burret, Notizbl. Bot. Gart. Berlin 10: 920. 1930. San Miguel, Río Sarapiquí, *Wendland*. Endemic. A tall, unarmed palm; leaves pinnate, the segments green, cuneate, 50–170 cm. long; branches of the spadix furcate, glabrous, the flowers ternate, monoecious; fruits globose, 2.5 cm. in diameter. In this genus the trunk is provided near the base with numerous prop or aerial roots that are very hard and strong, and help to hold it erect.

### MANICARIA Gaertn.

**Manicaria saccifera** Gaertn. *Yolillo*. Abundant in swamps of some parts of the Atlantic coast, forming large colonies of characteristic aspect. The species occurs in many parts of the Atlantic coast of Central America, and also in South America. Trunk thick and short, but the leaves very large, and the whole plant as much

as 6 meters high; leaves entire but often torn by the wind, unarmed; spadices branched, a meter long, the flowers monoecious, sunk in the rachis; spathes 2; fruits 4–5 cm. in diameter, somewhat 3-lobate or occasionally bilobate or globose, covered with pyramidal tubercles. The wide leaves are employed locally for thatch, which is said to last for many years (40–50 years, according to some reports). The fruits are eaten by swine and other animals.

### NEONICHOLSONIA Dammer

Dwarf, acaulescent palms, the leaves pinnate; spadix simple, the flowers ternate, sunk in the rachis, monoecious; stamens 6, slightly coherent at the base, the anthers sagittate.—The genus consists of only the two Costa Rican species.

**Neonicholsonia Georgii** Dammer, Gard. Chron. III. 30: 178. 1901. Type collected in Costa Rica, without indication of the locality. Endemic. Leaf segments 20–22, lanceolate, acuminate, 30–36 cm. long; spadix as much as 55 cm. long.

**Neonicholsonia Watsoni** Dammer, Gard. Chron. III. 30: 179. 1901. Type collected in Costa Rica. Endemic. Leaf segments 18–20, elongate-lanceolate, 34–46 cm. long; spadix 40 cm. long, much more slender than in the preceding species.

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**Orbignya Cohune** (Mart.) Dahlgren. This palm, which ranges from Mexico to Honduras and probably farther south, has been reported for Costa Rica, with the common name of Palma real. It may be that it exists here, but it is more probable that the plant so reported is a species of *Scheelea*. The genus *Orbignya* is easy of recognition because of the much twisted and curled anthers; those of *Scheelea* are straight.

It is probable that there has been planted in Costa Rica the date palm, *Phoenix dactylifera* L., of African origin. It is cultivated commonly in the drier regions of Mexico, but does not thrive, or at least produce much if any fruit, in the more humid climate of Central America.

### PHOLIDOSTACHYS Wendl.

The only other species of the genus is native in Colombia.

**Pholidostachys pulchra** Wendl. ex Hemsl. Biol. Centr. Amer. Bot. 3: 410. 1885, nomen; Burret, Bot. Jahrb. 63: 130. 1930. *Geonoma pulchra* Wendl. ex Hemsl. loc. cit. in syn. Type collected by

Wendland in the Valley of Sarapiquí between San Miguel and El Muelle. Found by Koschny in San Carlos. Endemic. An elegant plant, forming colonies, the unarmed trunk 6–9 meters tall, 4–5 cm. thick; leaves terminal, 2 meters long, pinnatisect, the segments 12–16, lanceolate, very narrowly acuminate, 35–60 cm. long, 5–9 cm. wide; spadices pendent between the leaves, simple, tomentose, 50–60 cm. long; spathes 2, the inner one 30 cm. long; fruit obovoid, 28 mm. long, 2 of the cells abortive.

## PYRENOGLYPHIS Karst.

A genus of palms much like the species of *Bactris*, but the fruits longer than broad, with solid, firm flesh; the fruit of *Bactris* is usually broader than long, with a soft, red pulp. In *Pyrenoglyphis* the staminodia form a continuous ring; in *Bactris* they are absent or obscure and indistinct.

**Pyrenoglyphis balanoidea** (Oerst.) Karst. Fl. Columb. 2: 142. 1869. *Augustinea balanoidea* Oerst. Vid. Medd. Kjoebenhavn 1858: 39. 1859; Amérique Centrale *pl. 9, f. 1–13; Bactris balanoidea* Wendl. in Kerchov. Palm. 233. 1878. Type collected at Puntarenas by Oersted. Probably in all parts of the Pacific coast. British Honduras to Panama. Trunk 3 meters high, slender, armed with long spines; leaves pinnatifid; fruit glabrous and smooth, 3.5 cm. long.

There is little doubt that there grows in Costa Rica also *P. ovata* (Oerst.) Karst., a species based by Oersted upon plants from the north coast of Nicaragua and found more recently in Panama.

## RAPHIA Beauv.

**Raphia taedigera** Mart. *Yolillo.* Swamps of the Atlantic coast. Nicaragua to Brazil. An almost unarmed palm, the trunk short and thick; leaves pinnatisect, the segments with short spines on the margins; spadix very large, somewhat woody, said to persist for several years; fruits as large as an egg, covered with handsome, smooth, lustrous, imbricate scales. The Guatuso name is reported as Súuri. This palm may be recognized at once by the characteristic fruit, unlike that of any other plant of Central America. The Central American plant has been listed as *R. vinifera* Beauv.

## REINHARDTIA Liebm.

Reference: M. Burret, Die Palmengattungen *Reinhardtia* Liebm. und *Malortiea* H. Wendl., Notizbl. Bot. Gart. Berlin 11: 551–556. 1932.

Dwarf palms, unarmed, the stems slender and elongate or very short; leaves simple and bifid at the apex or pinnatisect, small; flowers monoecious, the spadix stalked, simple or simply branched; fruits small, ellipsoid, with a single seed.—Plants with more or less the appearance of the genus *Chamaedorea*.

**Reinhardtia Koschnyana** (Wendl. & Dammer) Burret, Notizbl. Bot. Gart. Berlin 11: 554. 1932. *Malortiea Koschnyana* Wendl. & Dammer, Gard. Chron. III. 29: 341. 1901. San Carlos, *Koschny*. Endemic. A dwarf plant, the leaves simple, short-bifid at the apex; spadix simple. *Reinhardtia latisecta* (Wendl.) Burret, reported by Hemsley from Costa Rica (Sarapiquí, *Wendland*), is a Guatemalan species.

**Reinhardtia rostrata** Burret, Notizbl. Bot. Gart. Berlin 11: 554. 1932; Ann. Naturhist. Mus. Wien 46: 228. 1933. Between La Castilla and Los Negritos, 12 km. from the mouth of Río Reventazón, *Cufodontis 700*. Wet forests of the Atlantic coast, ascending to Pejivalle (900 meters). Also in Nicaragua. Stem slender, as much as 2 meters high; leaves small, pinnatisect, the 4 segments cuneiform, with narrow perforations or "windows" close to the rachis; spadix with a few reddish branches. A neat and handsome palm, easy to recognize because of the perforations of the leaves. Other similar species grow in northern Central America.

**Reinhardtia simplex** (Wendl.) Burret, Notizbl. Bot. Gart. Berlin 11: 554. 1932. *Malortiea simplex* Wendl. Bot. Zeit. 17: 5. 1859. Sarapiquí, *Wendland*. Common in wet forests of the Atlantic coast and the mountains of Guanacaste, ascending to Pejivalle (900 meters). Also in Panama; cultivated in Europe. A dwarf plant, usually 60 cm. high; leaves simple, short-bifid at the apex, 13–18 cm. long, dentate; peduncle elongate, the spadix with a few erect branches, tinged with red. Illustrated in Curtis' Bot. Mag. *pl. 5247*. Of interest as being the smallest palm of Costa Rica, producing flowers when only 30 cm. high.

## ROYSTONEA O. F. Cook

**Roystonea regia** (HBK.) O. F. Cook. *Palma real. Oreodoxa regia* HBK. Native of Cuba and Florida, this palm is seen frequently in parks and fincas of Costa Rica. Of all cultivated palms, it is the most popular in the American tropics, because of its majestic and handsome appearance. This species may be recognized by its smooth and somewhat swollen trunk, somewhat recurved leaves,

and spherical fruits. It is possible that there has been planted in Costa Rica also *R. oleracea* (Mart.) O. F. Cook (*Oreodoxa oleracea* Mart.), native of Barbados, which has horizontal leaves and oval or oblong fruits. At the finca of the United Fruit Company at La Colombiana there is an exceptionally handsome and long double row of royal palms that have attained a fine development.

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Under the local name of Palma de sombreros Pittier has listed for Costa Rica (under the generic name *Inodes*, synonym of *Sabal*) a plant about which he writes: "A palm frequently cultivated or half-cultivated near the dwellings of the people of the Pacific coast. It is unknown in Costa Rica in a wild state. The leaves are employed for making the every-day hats worn by the country people of that coast." If really referable to the genus *Sabal*, it is probable that this palm has been imported from northwestern Central America.

### SCHEELEA Karst.

Tall, unarmed palms, the large leaves pinnate; flowers monoecious; spathes greatly elongate, more or less persistent, woody; spadix elongate, with numerous lateral branches that are short and densely flowered, in fruit forming a compact, pendent panicle; fruits ellipsoid or oval, containing 1–7 seeds.

**Scheelea costaricensis** Burret, Notizbl. Bot. Gart. Berlin 10: 684. 1929. *Corozo.* Type collected in Costa Rica by Hoffmann, without indication of the locality. Endemic. Fruit small, oblong, 5.5 cm. long, short-beaked, containing a single seed. The description by Burret was based upon fruits only.

**Scheelea gomphococca** (Mart.) Burret. *Palma real.* To this species is referred a tall palm that abounds in the savannas of Guanacaste and in other parts of the Pacific coast, but it is not certain that the Costa Rican plant is the one described by Martius (from "America meridionali"). Trunk thick, about 10 meters tall; leaves very large, the segments linear; leaf sheaths persistent upon the trunk. The leaves are employed for construction of temporary huts.

**Scheelea rostrata** (Oerst.) Burret, Notizbl. Bot. Gart. Berlin 10: 688. 1929. *Attalea rostrata* Oerst. Vid. Medd. Kjoebenhavn 1858: 50. 1859. Near Puntarenas, *Oersted.* Probably common on the Pacific coast. Endemic. Trunk 4–6 meters tall; leaves 3.5–4.5 meters long, the segments almost a meter long, linear; spathes 1.5–2 meters long. For this species there have been listed the following Indian names: Urú (Cabécara); Orú (Bribrí); Su (Térraba).

At present very little is known of the *Scheelea* species native in Costa Rica. This results in part from the great size of the plants, making it difficult to prepare usable material of them for study.

## SOCRATEA Karst.

**Socratea durissima** (Oerst.) Wendl. Bonplandia 8: 103. 1860. *Maquenque, Maquengue, Palmito. Iriartea durissima* Oerst. Vid. Medd. Kjoebenhavn 1858: 30. 1859. Type collected in Nicaragua on the banks of the San Juan, not far from the Costa Rican border. Common on the Atlantic coast, and reported also for the Pacific. A beautiful palm, as much as 25 meters high, unarmed, the trunk smooth, green, provided near the base with aerial roots that are stilt-like and as much as 3 meters in length; leaves 1.5–2 meters long, the few segments cuneiform, 30–60 cm. long; spadices arising below the leaves, glabrous, branched, the flowers monoecious, white; fruits oblong, 2.5–3 cm. long. Nicaragua to Panama. One of the handsomest palms of Central America. Its wood is hard and durable. The plant has an important role in construction by the Indians and other inhabitants of the Atlantic coast. The cabbage of young leaves is a vegetable of good flavor. Among Indian names reported are: Uráa-krá (Brunka); Rru (Térraba). This palm has appeared in works treating the Costa Rican flora as *Iriartea exorrhiza* Mart.

## SYNECHANTHUS Wendl.

Slender, dwarf palms, unarmed, with the general appearance of *Chamaedorea*, but the flowers monoecious; spadix simply branched, the numerous branches slender, elongate, flexible and somewhat flexuous, the whole inflorescence suggestive of a broom.

**Synechanthus angustifolius** Wendl. in Koch & Fint. Wochenschr. 15. 1859. Based upon Costa Rican plants. Differing from the following species by the narrower leaf segments, and probably only a form of it. Endemic. Of this species I have seen only a photograph of the type.

**Synechanthus Warscewiczianus** Wendl. Bot. Zeit. 16: 145. 1858. *Reineckia triandra* Karst. in Koch & Fint. Wochenschr. 349. 1858; *Collinia fibrosa* Oerst. Vid. Medd. Kjoebenhavn 1858: 5. 1859; *Nunnezharoa Warscewicziana* Kuntze, Rev. Gen. 731. 1891. Type collected in Costa Rica by Warscewicz. Common in wet forests along the Atlantic coast, and also on the Pacific, and ascending to Pejivalle (900 meters); region of San Ramón. Also in Panama. Trunk green, up to 4.5 meters in height, 2.5 cm. thick, smooth;

leaves a meter long, the 16-20 segments lanceolate; spadix glabrous; fruits oblong, 1.5 cm. long, black when ripe.

### WELFIA Wendl.

Two other species of the genus are known, in Honduras and Colombia.

**Welfia Georgii** Wendl. in Kerchov. Palm. 258. 1878, nomen; Burret, Bot. Jahrb. 63: 125. 1930. Type collected in the Valley of Sarapiquí, between San Miguel and El Muelle. Endemic. An elegant palm, forming colonies, the unarmed trunk 20 meters high, 10 cm. thick; leaves 20–30, terminal, 6–7 meters long, pinnatisect, the segments 80–120, lanceolate, the middle ones a meter long, 7 cm. wide; spadices binate or ternate, 70–90 cm. long, pendent, the branches 60–80 cm. long; drupes oblong-ellipsoid, 3.5–4.5 cm. long, violet, with a single seed.

## CYCLANTHACEAE

The family is represented in Central America by only two genera. The plants in general appearance are much like palms, but have very different inflorescences.

### CARLUDOVICA Ruiz & Pavón

Epiphytic or terrestrial plants, acaulescent or with elongate stems; leaves petiolate, bifid or flabellate, the segments narrow, with few or numerous parallel nerves; flowers monoecious, arranged upon an oblong or cylindric spadix, this subtended by 2–6 large spathes; fruit a fleshy syncarp, composed of numerous berries each with many seeds.—The genus was dedicated by its authors to Carlos XI of Spain and his queen, Luisa.

**Carludovica ensiformis** Hook. f. Bot. Mag. *pl. 6418.* 1879. *Palma.* Based upon plants cultivated in the Kew Gardens, London, of Costa Rican origin. Common in wet forests of the volcanoes and the mountains of Guanacaste; El Muñeco; Guápiles; San Ramón; at 300–2,000 meters. Plants acaulescent or with a short stem; petioles long, the blade 1-costate, its segments linear, 3–4-nerved, 1.5–3 cm. wide; spathes about 4; spadix oblong or subglobose. At first green, the fruits turn red, and when fully ripe white. They are then intensely fragrant, with a sweet and agreeable odor. Endemic.

**Carludovica irazuensis** Cufodontis, Archivio Bot. 9: 4. 1933. *Coligallo, Palmiche.* Near Guayabillos, Volcán de Irazú, 2,250 meters, *Cufodontis 466.* Common in wet forests of the Meseta

Central and the Cantón de Dota; Pejivalle; at 900–2,400 meters. Endemic. Plants acaulescent or with a short stem, terrestrial or epiphytic, sometimes forming dense clumps; leaves distichous, the petioles elongate; blade biparted, 1-costate, the segments 5–8 cm. wide, 7–12-nerved; fruits at first green, turning red, white when fully matured. Plants handsome and very ornamental, like the preceding species.

**Carludovica microcephala** Hook. f. Bot. Mag. *pl. 7263.* 1892. Based upon plants cultivated at the Kew Gardens, London. Wet forests of the Atlantic coast; Guápiles and elsewhere. Also in Honduras. Plants terrestrial, 30–60 cm. high, acaulescent; petioles slender and elongate; blade bifid, 15–25 cm. long, 1-costate, the segments linear-lanceolate, 8-nerved; spathes only 2, the spadix very short and slender, green. This species seems to be always terrestrial. It grows in damp or wet places, often on banks of small streams in dense forest where it has little competition from other vegetation.

**Carludovica microphylla** Oerst. Vid. Medd. Kjoebenhavn 1857: 197. 1858. *Coligallo, Chidra, Palma.* Type collected at Turrialba by Oersted. Abundant in wet forests of the Meseta Central and San Ramón, and in Guanacaste, ascending the slopes of the volcanoes to 2,000 meters. A vine with long, slender stems, ascending tall trees; leaves alternate, short-petiolate, the blade bifid, the segments linear-lanceolate, acuminate, 4–6-nerved; spathes 6–8; spadix green, 2.5–3 cm. long. Endemic.

**Carludovica Oerstedii** Hemsl. Biol. Centr. Amer. Bot. 3: 416. 1885. *Coligallo, Chirrivaca, Chidra, Tucuso* (Oersted). *Evodianthus angustifolius* Oerst. Vid. Medd. Kjoebenhavn 1857: 195. 1858; Amér. Centr. *pl. 1;* non *C. angustifolia* Ruiz & Pavón. Type collected at Turrialba by Oersted. Abundant in wet forests of the Atlantic coast. Honduras to Panama. A large vine; petioles short or elongate, the blade bifid, rough to the touch, 1-costate, the segments lanceolate, 30–60 cm. long, with numerous nerves; spathes 2 or 3; spadix globose or oblong. Easy of recognition because of the rough surface of the leaves. Oersted states that the Indians ate the ripe spadices of this species, like those of *C. utilis,* but I have never heard mention of the edible quality of the fruits, so it is probable that they are no longer eaten.

**Carludovica palmata** Ruiz & Pavón. *Chidra, Palma de sombrero, Pita, Tuna* (Bribrí name). *C. incisa* Wendl. Ind. Palm. 67.

1854; *C. rotundifolia* Wendl. ex Hook. f. Bot. Mag. *pl. 7083*. 1889 (based upon cultivated plants of Costa Rican origin). Abundant in wet forests of the coasts, ascending to an elevation of 2,000 meters. Southern Mexico to Peru. Plants acaulescent, forming dense clumps; petioles 1–2 meters high; blade 3–4-parted, a meter broad; spadix 10–20 cm. long, the staminodia white, very slender, as much as 15 cm. long, very conspicuous; syncarp red at maturity. From the young leaves, bleached and divided into thin strips, are made the celebrated Panama or Jipijapa hats, most of which come from a limited region of Ecuador. This industry, formerly practiced by the Indians of Costa Rica, is followed now only in a few remote villages, but large quantities of Panama hats, of both poor and fine quality, are imported into Central America. It is noteworthy that some of the poorer laborers of Central America take as great pride in their hats as the cowpunchers of the western United States in their hats and boots, and they often wear fine Panama hats whose value is probably greater than that of all their other earthly possessions. The Panama hat palm is a handsome and ornamental plant, and often is cultivated in Costa Rican gardens.

**Carludovica stenophylla** Standl., sp. nov.—Caudex elongatus scandens gracilis; folia longipetiolata, lamina profunde bifida unicostata, segmentis linearibus 30–60 cm. longis 1.5–2.5 cm. latis longiattenuatis 8–10-nerviis; inflorescentiae ignotae.—El Muñeco, south of Navarro, Prov. Cartago, 1,400 meters, February, 1924, *Standley 33829* (type in U. S. Nat. Herb.). An endemic species, common in wet forests of the central region, at 1,400–2,400 meters. A long vine, the petioles elongate, the blade bifid, its linear segments 8–10-nerved. Although the inflorescences of this distinct plant are not known, it seems desirable to give it a specific name in order to have a definite means of referring to it.

**Carludovica utilis** (Oerst.) Benth. & Hook. *Coligallo, Cola de gallo, Tucuso* (Oersted), *Palma, Chidra. Sarcinanthus utilis* Oerst. Vid. Medd. Kjoebenhavn 1857: 197. 1858; Amér. Centr. *pl. 2*. Type collected at Jarís by Oersted. Common in the tierra caliente of the Atlantic slope, and in Guanacaste; San Ramón; ascending to La Hondura, 1,400 meters. British Honduras to Panama. A large vine; petioles elongate, the blade bifid, 3-nerved, the segments 40–60 cm. long or larger, 7–15 cm. wide, with numerous nerves; spathes 5 or more, usually persistent, the spadix 5–8 cm. long; fruit yellowish at maturity. A conspicuous, large vine in the forests, climbing upon

tall trees. The leaves formerly were employed, and probably still are used, in the manufacture of hats. In Honduras the strong and flexible stems of this and other species are employed for making furniture similar to that made from willow.

### CYCLANTHUS Poit.

In Central America there is a single species.

**Cyclanthus bipartitus** Poit. *Hoja de lapa, Tornillo.* Abundant in wet forests of the whole Atlantic coast, ascending to El Muñeco (1,400 meters); region of San Ramón. A species of wide distribution in Central and South America. Plants terrestrial and acaulescent, 1–2 meters high, forming dense clumps; petioles elongate, the blade biparted, 50–100 cm. long, the segments linear-lanceolate, 7–15 cm. wide; flowers monoecious, arranged upon the spadix in alternating whorls of staminate and pistillate flowers; fruit suggesting a screw in its form, 10–20 cm. long; spathes 4 or 5.

## ARACEAE. Arum Family

References: A. Engler, Araceae, in Pittier, Prim. Fl. Costar. 2: 343–365. 1898; A. Engler & K. Krause, Araceae, Pflanzenreich IV. 23. 1905–1920.

A large family, mostly of tropical distribution in all parts of the earth, well represented in almost all regions of Costa Rica, especially in the wet lowlands. The plants are terrestrial or epiphytic, often with long, scandent stems. The inflorescence, which resembles a single flower, consists of a green or variously colored spathe, enclosing a cylindric spadix that bears the small true flowers. A typical representative of the family is the calla (called Cartucho in Costa Rica), a common ornamental plant of gardens. The flowers are perfect or staminate and pistillate, the staminate borne upon the upper part of the spadix. The fruits are small berries, which sometimes are edible. All parts of the plant often or usually contain needle-shaped crystals of calcium oxalate. When a piece of the leaf is chewed, these crystals penetrate the tongue, causing it to swell with much attendant irritation or pain.

### ANEPSIAS Schott

**Anepsias Moritzianus** Schott. Santa María de Dota. Also in Venezuela; unknown elsewhere in Central America. A scandent epiphyte, the leaves ovate-oblong.

## ANTHURIUM Schott

The largest genus of the family, with 65 or more species in Central America. Most of the species are epiphytic plants, but some are terrestrial. In the epiphytic forms the stems are sometimes scandent, but more often very short.

**Anthurium acutangulum** Engler, Bot. Jahrb. 25: 371. 1898. Near San José, 1,200 meters, *Tonduz 10360*. Meseta Central; mountains of Guanacaste. Epiphytic; spikes dark red.

**Anthurium acutifolium** Engler, Bot. Jahrb. 25: 365. 1898. Rodeo de Pacaca, *Pittier 4099*. Also at Boruca and Buenos Aires; region of San Ramón. Endemic.

**Anthurium aemulum** Schott. *A. bombacifolium* Schott, Prodr. 552. 1860 (Costa Rica, *Hoffmann*). Forests of the coasts. Also in Mexico. A scandent epiphyte with slender stems; spadix purple; fruits red or purple.

**Anthurium Bakeri** Hook. f. Bot. Mag. *pl. 6261*. 1879. Described from plants cultivated in Kew Gardens, London, imported from Costa Rica. A common species of the coasts and of Guanacaste, ascending the slopes of the mountains (Barba). Endemic. An epiphyte, the fruits deep red.

**Anthurium barbanum** Krause, Notizbl. Bot. Gart. Berlin 9: 270. 1925. Volcán de Barba, *A. C. Brade 2510*. Region of San Ramón. Endemic.

**Anthurium concinnatum** Schott. Meseta Central and Atlantic slope, 900–1,800 meters; Guanacaste; region of San Ramón. Also in Guatemala. Either epiphytic or terrestrial.

**Anthurium consobrinum** Schott. *A. eximium* Engler, Bot. Jahrb. 25: 412. 1898 (Punta Mala, *Tonduz 6768*). Wet forests of the coasts; region of San Ramón; epiphytic. Fruits white. Also in Nicaragua.

**Anthurium consobrinum** var. **cuneatissimum** Engler, Pflanzenreich IV. 23b: 186. 1905. Llanuras de Santa Clara, 250 meters, *J. D. Smith 6811*. Endemic.

**Anthurium costaricense** Engler, Bot. Jahrb. 25: 398. 1898. Agua Caliente, 1,800 meters, *Lehmann*. Endemic. An epiphyte.

**Anthurium crassinervium** (Jacq.) Schott. *Tabacón*. Atlantic coast. A species of wide distribution. A large epiphyte with

broad leaves, the fruit spikes thick and red. A showy and conspicuous plant, usually growing high on the trees.

**Anthurium cuspidifolium** Schott, Oesterr. Bot. Zeitschr. 180. 1858. Type collected in Costa Rica by Oersted. Endemic.

**Anthurium densinervium** Engler, Bot. Jahrb. 25: 386. 1898. Forests of the Río Hondo, near Madre de Dios, 200 meters, *Pittier 10346*. Atlantic coast to the slopes of the volcanoes, ascending to 1,800 meters. Terrestrial or epiphytic. Endemic.

**Anthurium Donnell-Smithii** Engler, Bot. Jahrb. 25: 389. 1898. Río Jiménez, Llanuras de Santa Clara, 280 meters, *J. D. Smith 4979*. Wet forests of the Atlantic slope, at 200–1,450 meters. Endemic. A scandent epiphyte.

**Anthurium Durandii** Engler, Bot. Jahrb. 25: 401. 1898. Between La División and Alto del Palmital, *Pittier 3868*. Also at Turrialba, 570 meters. Endemic.

**Anthurium firmum** Engler, Bot. Jahrb. 25: 460. 1898. Cañas Gordas, 1,100 meters, *Pittier 11130*. Endemic. A scandent epiphyte.

**Anthurium flexile** Schott, Oesterr. Bot. Zeitschr. 1858: 180. 1860. Pedregal, *Wendland*. Collected at Tilarán, Guanacaste. Also in Nicaragua. A small, scandent epiphyte.

**Anthurium formosum** Schott, Oesterr. Bot. Zeitschr. 181. 1858. Naranjo, *Wendland*. Tuis; Santa María de Dota; 500–1,500 meters. An endemic epiphyte, the leaves oblong-cordate, as much as 1 meter long and 40–50 cm. wide.

**Anthurium Friedrichsthalii** Schott. Forests of the Atlantic slope, at 1,200 meters or less; region of San Ramón. Guatemala to South America. Epiphytic.

**Anthurium hacumense** Engler, Bot. Jahrb. 25: 363. 1898. Río Hacúm near Buenos Aires, 250 meters, *Tonduz 6536*. Also in Panama.

**Anthurium Hoffmannii** Schott, Oesterr. Bot. Zeitschr. 181. 1858. *A. margaritaceum* Baker in Saund. Refug. Bot. *pl. 280*. 1879. Uruca, Río Virilla, near San José, *Hoffmann*. Endemic. Common from the Meseta Central and Cantón de Dota to Boruca and Buenos Aires, 500–1,600 meters; region of San Ramón. An epiphytic or terrestrial plant with heart-shaped leaves.

**Anthurium Holtonianum** Schott. Common on the coasts. Extending to Colombia. A large, epiphytic vine, climbing tall trees; leaves 5-parted, the segments 60–100 cm. long, more or less lobate.

**Anthurium Johnii** Engler, Pflanzenreich IV. 23B: 119. 1905. Suerre, Llanuras de Santa Clara, 300 meters, *J. D. Smith 6812*. A common plant of the Atlantic coast, ascending the slopes of the volcanoes to 1,500 meters. Spadix dark red.

**Anthurium joseanum** Engler, Pflanzenreich IV. 23B: 68. 1905. Growing upon rocks, Las Vueltas, Tucurrique, *Tonduz 12818*. Atlantic coast; region of Tilarán. Endemic.

**Anthurium lancifolium** Schott, Oesterr. Bot. Zeitschr. 180. 1858. Volcán de Turrialba, *Wendland*. Endemic.

**Anthurium latihastatum** Engler ex Krause, Notizbl. Bot. Gart. Berlin. 11: 612. 1932. Cerros de Tremendal, San Ramón, 1,300 meters, *Tonduz 17708*. Region of San Ramón. Endemic.

**Anthurium littorale** Engler, Bot. Jahrb. 25: 405. 1898. Near Sierpe, Atlantic coast, *Pittier 6837*. Also in Panama.

**Anthurium microspadix** Schott. *A. tapinostachyum* Schott, Oesterr. Bot. Zeitschr. 180. 1858 (Candelaria, *Hoffmann*). Meseta Central and slopes of the volcanoes, and in regions of less elevation, 200–2,000 meters. A small, scandent plant with oblong leaves. Also in Ecuador.

**Anthurium myosuroides** (HBK.) Endl. Slopes of Volcán de Barba to El General, 500–1,800 meters. A scandent epiphyte, growing also in Colombia and in other regions of Central America.

**Anthurium myosuroides** var. **angustifolium** Engler, Bot. Jahrb. 25: 382. 1898. Matina, *Pittier 9797*.

**Anthurium obtusilobum** Schott, Oesterr. Bot. Zeitschr. 181. 1858. *Comida de culebra*. San Miguel, *Wendland*. Collected near San José and in Cantón de Dota, 1,100–2,000 meters. Endemic.

**Anthurium ochranthum** C. Koch, Ind. Sem. Hort. Berol. App. 16. 1853. *A. lapathifolium* Schott, Oesterr. Bot. Wochenbl. 309. 1857. Collected in Costa Rica by Wendland. Also in Panama.

**Anthurium Oerstedianum** Schott, Oesterr. Bot. Zeitschr. 180. 1858. Naranjo, *Oersted*. Endemic.

**Anthurium pallens** Schott, Oesterr. Bot. Zeitschr. 180. 1858. Desengaño, 2,600 meters, *Wendland*. Common throughout the

central region and in Guanacaste and Cantón de Dota; San Ramón; 900–2,600 meters. Endemic. A small plant, scandent, epiphytic or terrestrial.

**Anthurium panduriforme** Schott, Prodr. 536. 1860. *A. panduratum* Schott, Oesterr. Bot. Zeitschr. 182. 1858, non *A. panduratum* Mart. 1855. Cartago, *Oersted.* Central region and in Guanacaste, 700–1,800 meters; San Ramón. Also in Colombia. Epiphytic or terrestrial, the leaves 3-lobate, the spathe purple.

**Anthurium Pittieri** Engler, Bot. Jahrb. 25: 373. 1898. Rancho Flores, region of Barba, 2,030 meters, *Pittier 865.* A common species of the Meseta Central and slopes of the volcanoes, extending to the Atlantic coast; Cantón de Dota; region of San Ramón; 100–2,100 meters. Also in Panama. An epiphytic plant, sometimes scandent.

**Anthurium porrectum** Schott, Oesterr. Bot. Zeitschr. 180. 1858. Desengaño, 2,350 meters, *Wendland.* Slopes of the volcanoes, and Cantón de Dota, 1,300–2,500 meters. Endemic. A scandent epiphyte.

**Anthurium Porschianum** Krause, Ann. Naturhist. Mus. Wien 46: 231. 1933. Between La Castilla and Los Negritos, 12 km. from the mouth of Río Reventazón, *Cufodontis 611.* Endemic. Related to *A. Pittieri.*

**Anthurium protensum** Schott, Oesterr. Bot. Zeitschr. 181. 1858. Volcán de Barba, 2,500–2,700 meters, *Oersted.* Slopes of the mountains, also on the Pacific coast, 200–2,700 meters. Endemic. An epiphyte, sometimes scandent.

**Anthurium ramonense** Engler ex Krause, Notizbl. Bot. Gart. Berlin 11: 611. 1932. San Ramón, 1,200 meters, *Tonduz 17703.* Region of San Ramón. Endemic.

**Anthurium ranchoanum** Engler, Bot. Jahrb. 25: 421. 1898. Rancho Flores, 2,100 meters, *Pittier 2295.* Region of Santa María de Dota and Volcán de Barba. A small, scandent epiphyte. Endemic.

**Anthurium rigidulum** Schott, Oesterr. Bot. Zeitschr. 180. 1858. *Maicillo.* Cartago, *Oersted.* Common on the Atlantic slope, 400–1,800 meters. Also in Panama and Colombia. A small epiphyte. The purple fruits are said to be edible.

**Anthurium scandens** (Aubl.) Engler. *Elotillo, Elotico, Maicillo, Bejuco real.* Abundant in almost all the wet regions, from the

coasts to an elevation of 2,200 meters. Terrestrial or more commonly epiphytic, with short or elongate stems. The strong and flexible stems are used for making baskets and for tying together the framework of huts.

**Anthurium Scherzerianum** Schott. *Lengua del diablo.* Common in wet forests of the central region, 1,300–2,100 meters; Aguacate. Also in Guatemala. A terrestrial plant, the leaves oblong-elliptic or oblong-lanceolate, 10–25 cm. long; inflorescences of an intense and vivid red; fruits red. Probably the most showy *Anthurium* species, introduced into Europe about 1850, and now well known in hothouses almost throughout the world. Engler lists about 40 forms recognized in cultivation, distinguishable by the shape of the leaves, color of the inflorescence, etc. The species has been hybridized, also, with other cultivated species of *Anthurium.* In the wild plants the spathe seems to be always red, but in garden plants it is often white or yellow. Potted plants of the species are often offered for sale in the flower shops of United States cities, as in Chicago, for instance.

**Anthurium Schlechtendalii** Kunth. Tilarán, growing upon rocks. Also in Mexico.

**Anthurium scolopendrinum** (Hamilt.) Kunth. Common on the Atlantic coast. A species of wide distribution. Epiphytic.

**Anthurium spectabile** Schott, Prodr. 144. 1860. Volcán de Turrialba, *Wendland.* Also at Guápiles. Endemic.

**Anthurium subcordatum** Schott. Slopes of Volcán de Barba, 1,600–2,000 meters. Also in Guatemala.

**Anthurium subsignatum** Schott, Bonplandia 9: 368. 1862. Pedregal, *Wendland.* Plants collected at Guápiles perhaps represent the same species. Endemic.

**Anthurium talamancae** Engler, Bot. Jahrb. 25: 386. 1898. Forests near Shirores, Talamanca, 100 meters, *Tonduz 9229.* Endemic.

**Anthurium tetragonum** Schott, Prodr. 475. 1860. Region of Talamanca, 100–200 meters. Also in Panama. A large epiphyte.

**Anthurium tilaranense** Standl. Journ. Wash. Acad. Sci. 17: 245. 1927. Wet forest of Quebrada Serena, southeast of Tilarán, Guanacaste, 700 meters, *Standley & Valerio 46310.* Collected also at Los Ayotes in the same region. Endemic. An epiphyte, the leaves deeply 3-lobate.

**Anthurium Tonduzii** Engler, Bot. Jahrb. 25: 376. 1898. Near San Marcos, in forests of Alto del Pito, 1,400 meters, *Tonduz 7683*. Endemic. A scandent epiphyte.

**Anthurium torresianum** Engler, Bot. Jahrb. 25: 428. 1898. Río Torres, near San Francisco de Guadalupe, 1,170 meters, *Tonduz 10147*. Meseta Central to the Atlantic coast, and in Cantón de Dota, 200–2,000 meters. Endemic. Epiphytic; spadix red or white.

**Anthurium triangulum** Engler, Bot. Jahrb. 25: 383. 1898. Forests near Shirores, Talamanca, 100 meters, *Pittier & Tonduz 9225*. Atlantic coast. Endemic. A terrestrial plant.

**Anthurium trinerve** Miq. *Elotillo, Elotico*. Abundant in the Meseta Central and on slopes of the volcanoes; Cantón de Dota; 1,000–2,000 meters. A species of wide distribution.

**Anthurium tsakianum** Engler, Bot. Jahrb. 25: 423. 1898. Forests near Tsaki, Talamanca, 200 meters, *Tonduz 9510*. Endemic.

**Anthurium turrialbense** Engler, Bot. Jahrb. 25: 406. 1898. Río Turrialba, 500 meters, *J. D. Smith 4978*. Endemic.

**Anthurium Valerii** Standl., sp. nov.—Planta ut videtur acaulis omnino glabra; petiolus 18–23 cm. longus gracilis; lamina lanceolato-oblonga 19–25 cm. longa 7.5–9.5 cm. lata fere a basi versus apicem sensim angustata, apice acuta vel acuminata, basi breviter (ad 1.5 cm.) cordata, sinu lato, lobis posticis late rotundatis, crasse papyracea, supra viridis, costa prominente, nervis venisque quoque prominentibus vel prominulis, subtus fere concolor, costa gracili elevata, nervis lateralibus utroque latere circiter 15 tenuibus prominentibus fere rectis angulo lato divergentibus prope marginem in nervum collectivum irregularem conjunctis, venulis prominulis laxiuscule reticulatis; pedunculus 10 cm. tantum longus gracillimus; spatha late oblonga 3 cm. longa apiculato-obtusa 1.5 cm. lata, basi rotundato-truncata; spadix juvenilis 7 mm. longe stipitatus crassiusculus in sicco fusco-purpurascens fere 3 cm. longus obtusus 5 mm. diam.—Santo Domingo de Vara Blanca, 2,200 meters, April, 1936, *Manuel Valerio 1600* (type in Herb. Field Mus.).

**Anthurium Wendlandii** Schott, Oesterr. Bot. Zeitschr. 182. 1858. San Miguel, *Wendland*. Endemic. A large vine, the leaves 13-lobate, the segments again lobate.

## CALADIUM Vent.

**Caladium bicolor** (Ait.) Vent. *Corazón de Jesús*. Collected in the Llanuras de Santa Clara, but probably naturalized there.

The plant is a native of Brazil but is cultivated in gardens of Costa Rica, as well as in tropics of most parts of the earth and in hothouses elsewhere. It may be recognized easily by the cordate, peltate leaves, variegated with various colors—pink, red, yellow, and white. In other Central American countries it is sometimes called Paleta de pintor.

### COLOCASIA Schott

**Colocasia esculenta** (L.) Schott. An ornamental plant of gardens with huge, green, heart-shaped leaves a meter long or larger. Native of the East Indies.

### DIEFFENBACHIA Schott

The plants of this genus are terrestrial, about a meter high, with thick and solid stems, the leaves oblong or ovate, thick and fleshy. The fruits are bright red at maturity. When cut, the plant exhales an offensive, skunk-like odor. The milky sap of the leaves is very irritating, causing inflammation of the skin in some persons. The plants are rather handsome and are cultivated commonly in hothouses of temperate regions.

**Dieffenbachia aurantiaca** Engler, Bot. Jahrb. 26: 566. 1899. Forests near Santo Domingo de Golfo Dulce, *Tonduz 9961*. I collected the species at El Arenal, on the Atlantic slope of Guanacaste. The spathes are orange-colored. Endemic.

**Dieffenbachia Leopoldii** Bull, Cat. 4. 1878. Type collected at Siquirres. In cultivation in Europe. Endemic.

**Dieffenbachia Oerstedii** Schott, Oesterr. Bot. Zeitschr. 179. 1858. Cerro de Aguacate, *Oersted*. Region of San Ramón. Also in Guatemala and Nicaragua.

**Dieffenbachia Pittieri** Engler & Krause, Pflanzenreich IV. 23Dc: 42. 1915. Wet forests of the Atlantic coast. Also in Panama. The spathe is green.

**Dieffenbachia Seguina** (L.) Schott. *Sahinillo, Comida de culebra*. Abundant in forests of the Atlantic coast and in moister parts of the Pacific coast. A species of rather wide distribution. Many of the wild plants have leaves variegated with white or pale yellow; such forms are popular in cultivation in the United States.

### DRACONTIUM L.

Large or small plants, arising from a hard tuber that sometimes is very large, producing a single leaf that is 3-parted, and has few

or numerous 2–3-parted segments.—One of the most extraordinary plants of all Central America is *D. gigas* (Seem.) Engler, of Chontales, Nicaragua (it may well exist also in Costa Rica), whose leaf is as much as 3–4 meters high, and its spathe 40–50 cm. long.

**Dracontium costaricense** Engler, Pflanzenreich IV, 23C: 44. 1911. Forests of Shirores, Talamanca, 100 meters, *Pittier 9232*. Also on the Atlantic coast near the Reventazón, where the Jamaicans give it the name of "mountain cabbage." The large leaves are as much as a meter wide.

**Dracontium Pittieri** Engler, Bot. Jahrb. 37: 122. 1905. *Hombrón*. Banks of Río Naranjo, 200 meters, *Pittier & Tonduz 7515*. Also Boca Culcha, Pacific coast. Endemic. Petioles as much as 3 meters high, the peduncle up to 2 meters in length; spathe reddish violet.

**Dracontium polyphyllum** L. Río Barbilla, collected by Cufodontis; determined by Krause. Ranging to the Guianas.

## HETEROPSIS Kunth

**Heteropsis oblongifolia** Kunth. Atlantic coast. Also in Brazil. The genus is unknown north of Costa Rica. A scandent epiphyte, the leaves elliptic-oblong, fleshy and somewhat leathery, 10–17 cm. long.

## HOMALONEMA Schott

**Homalonema Wendlandii** Schott, Prodr. 308. 1860. Type collected in Costa Rica by Wendland, without definite locality. The genus does not extend north of Costa Rica, and most of the species are natives of the Old World tropics. The Costa Rican plant is terrestrial.

## MONSTERA Adans.

Large vines, attached to the trunks of tall trees by aerial roots. Eleven species are known from Central America. They constitute a conspicuous feature of the coastal forests, sometimes climbing to the tops of the tallest trees. Various species are much grown for ornament in hothouses of the United States.

**Monstera acuminata** C. Koch. Tierra caliente of Atlantic slope, at 700 meters or less. Also in Guatemala. Leaves ovate, entire.

**Monstera dilacerata** C. Koch. *Chirrivaca*. Common on the Atlantic coast, ascending the slopes of the volcanoes to 1,800 meters;

Guanacaste. Ranging to Venezuela. Leaves very large, with numerous perforations or "windows." The well ripened spadices of this and other species are white, very juicy, sweet, and edible, but it is necessary to exercise caution in eating them because of the calcium oxalate crystals that they contain.

**Monstera epipremnoides** Engler, Bot. Jahrb. 37: 118. 1905. Forests of Santa María de Dota, 1,300 meters, *Pittier 2486*. Also at Uruca, 1,160 meters. Endemic. Leaves large, pinnatifid.

**Monstera Friedrichsthalii** Schott. *Piñanona, Ventanilla.* Abundant in the Meseta Central; Aguacate; Guanacaste; region of San Ramón. Guatemala to Panama. A large vine, the leaves with numerous large and small perforations; ripe fruit greenish white.

**Monstera gigantea** Engler, Bot. Jahrb. 37: 118. 1905. Forests of Las Vueltas, Tucurrique, 635 meters, *Tonduz 13311*. Endemic. Leaves large, deeply pinnatifid.

**Monstera pertusa** (L.) de Vriese. *Chirrivaca.* Meseta Central to the Pacific coast; Guanacaste. Leaves as much as a meter long, with large perforations.

**Monstera Pittieri** Engler, Bot. Jahrb. 37: 116. 1905. Matina, *Pittier 9766*. Common on the Atlantic coast. Endemic. Leaves small, only 10–15 cm. long, entire.

### MONTRICHARDIA Crueger

**Montrichardia arborescens** (L.) Schott. Common on the Atlantic coast, growing in shallow water, in quiet streams or open swamps. Plants as much as 3 meters high, the thick, solid stems provided near the base with hard prop roots that hold the trunk erect. Inflorescences rather large and showy, the spathe white, resembling that of the calla (*Zantedeschia*). Guatemala to West Indies and northern South America.

### PHILODENDRON Schott

Plants variable in general appearance, either epiphytic or terrestrial. About 26 species are known from Central America.

**Philodendron Brenesii** Standl., sp. nov.—Scandens epiphytica glabra, caulibus non visis; petiolus ut videtur teres 12–28 cm. longus et ultra basi circiter 3 cm. longe vaginatus; lamina crassiuscula subcoriacea oblongo-ovata ca. 35 cm. longa et 15 cm. lata anguste sensim acuminata basi profunde cordata, lobis posticis 5–6.5 cm. longis subsemiorbicularibus, supra viridis, subtus paullo pallidior,

costa crassa elevata basi 5 mm. lata, nervis primariis utroque latere circa 11 pallidis elevatis, secundariis numerosis multo tenuioribus; inflorescentia perfecta non visa.—In forest, La Palma de San Ramón, 1,050–1,100 meters, *Brenes 5110* (type in Herb. Field Mus.). Between Guachipelín and Volcán de La Vieja, *Brenes 15565*.

**Philodendron gracile** Schott, Prodr. 244. 1860. Type collected in Costa Rica by Wendland. Leaves oblong-cordate. Endemic.

**Philodendron guatemalense** Engler. Growing on the coasts. Also in Guatemala. A scandent epiphyte, the leaves ovate or oblong-ovate.

**Philodendron guttiferum** Kunth. Common in the tierra caliente; Cantón de Dota; region of San Ramón; ascending to 1,800 meters. A large vine, the leaves oblong or oblong-elliptic. Guatemala to South America.

**Philodendron Hoffmannii** Schott, Oesterr. Bot. Zeitschr. 178. 1858. *Hoja de hombre.* Aguacate, *Hoffmann.* Also on the Atlantic coast and in Guanacaste; region of San Ramón. Panama to Guatemala. A large vine, the leaves cordate.

**Philodendron ligulatum** Schott, Prodr. 224. 1860. Type collected in Costa Rica by Wendland, without definite locality. Also in Colombia.

**Philodendron panamense** Krause. Plants collected on the Atlantic coast perhaps are referable to this species, which was described from Panama.

**Philodendron Pittieri** Engler, Bot. Jahrb. 26: 541. 1899. Ujarrás de Buenos Aires, *Pittier 11132.* Endemic. A scandent plant with cordate leaves.

**Philodendron pterotum** C. Koch, Ind. Sem. Hort. Berol. App. 6. 1854. Type collected in Costa Rica by Wendland. Forests of El Muñeco, Prov. Cartago, 1,400 meters. Endemic.

**Philodendron radiatum** Schott. Common on the Atlantic coast. Mexico and Central America. A large, coarse vine, the leaves pinnately parted.

**Philodendron rigidifolium** Krause. Atlantic coast. Also in Panama. A large vine with ovate leaves.

**Philodendron Schottianum** Wendl. ex Schott, Oesterr. Bot. Zeitschr. 72. 1865. Type collected in Costa Rica by Wendland,

without definite locality. Collected recently at Guápiles. A scandent epiphyte.

**Philodendron talamancae** Engler, Bot. Jahrb. 26: 511. 1899. Forests of Shirores, Talamanca, 100 meters, *Pittier & Tonduz 9223*. A scandent epiphyte with oblong leaves.

**Philodendron tripartitum** (Jacq.) Schott. *Comida de culebra, Mata de culebra, Daguilla.* Wet forests, Meseta Central to the Atlantic coast; region of San Ramón; abundant in many localities. A large vine with 3-parted leaves; fruits red.

**Philodendron trisectum** Standl., sp. nov.—Caulis ut videtur gracilis atque dense foliatus scandens; petiolus gracilis circa 30 cm. longus basi anguste 4 cm. longe vaginatus; lamina fere ad basin trisecta crasse chartacea, segmentis subaequalibus anguste lanceolato-oblongis circa 17 cm. longis et 3–4.5 cm. latis longe anguste acuminatis, basin versus paullo angustatis, exterioribus paullo angustioribus et subincurvis, costis crassis elevatis, nervis omnibus aequalibus tenerrimis obscuris numerosis; pedunculus 12 cm. longus vel ultra gracilis; spatha ut dicitur alba fere 10 cm. longa superne paullo attenuata prope basin fere 2 cm. crassa.—In forest, La Palma de San Ramón, 1,050 meters, *Brenes 5762* (type in Herb. Field Mus.). Well distinguished by the form of the leaves, quite unlike those of any other species known from Costa Rica.

**Philodendron verrucosum** Mathieu. *P. Cooperi* Engl. ex Donn. Smith, Enum. Pl. Guat. 4: 156. 1895, nomen nudum. Common in wet forests of the Atlantic slope, 200–1,800 meters; region of San Ramón. Also in Colombia. Plants terrestrial or epiphytic, the stems short or elongate; leaves cordate, bronze green, the upper surface with a beautiful velvety appearance; petioles covered with soft, slender scales. A handsome plant, cultivated sometimes in European hothouses.

**Philodendron Wendlandii** Schott, Prodr. 221. 1860. Type collected in Costa Rica by Wendland, without definite locality. Atlantic coast. Also in Panama. A more or less scandent epiphyte, the oblong leaves 30–40 cm. long.

### PISTIA L. Water lettuce

**Pistia Stratiotes** L. *Lechuga de agua.* Abundant in the tierra caliente. A species of wide distribution in the tropics. An aquatic plant, in appearance very different from other Araceae, floating upon

the surface of swamps and lakes, excessively abundant in some localities. It has the form of a rosette, composed of numerous pale, obovate, spongy leaves. The flowers are very small and inconspicuous. The plant is often grown in aquaria.

### PORPHYROSPATHA Engler

**Porphyrospatha Schottiana** (Wendl.) Engler in DC. Monogr. Phan. 2: 290. 1879. *Syngonium Schottianum* Wendl. ex Schott, Prodr. 200. 1860. Type collected in Costa Rica by Wendland, without definite locality. A scandent epiphyte. Endemic.

### RHODOSPATHA Poepp.

**Rhodospatha costaricensis** Engler & Krause, Pflanzenreich IV. 23B: 95. 1908. Finca Bostón, Atlantic coast, 30 meters, *Tonduz 14628*. Endemic. A scandent epiphyte, the leaves oblong.

**Rhodospatha Forgeti** N. E. Brown, Kew Bull. 358. 1913. Type collected in Costa Rica by Forget, without definite locality. Endemic. A scandent epiphyte, the leaves lance-oblong.

**Rhodospatha Wendlandii** Schott ex Engler in Mart. Fl. Bras. 3, pt. 2: 105. 1878. Type collected in Costa Rica by Wendland, the exact locality unknown. Endemic.

### SPATHIPHYLLUM Schott

Terrestrial plants, the leaves mostly more or less oblong and acuminate, the petioles elongate; spathe usually large and white, widely opened and almost flat.

**Spathiphyllum atrovirens** Schott, Oesterr. Bot. Zeitschr. 8: 179. 1858. Pedregal, *Wendland 1264*. Guápiles, and undoubtedly in other parts of the Atlantic coast; region of San Ramón, at 950 meters. Plants as much as a meter high. Endemic.

**Spathiphyllum Friedrichsthalii** Schott. *S. Wendlandii* Schott, Oesterr. Bot. Zeitschr. 8: 179. 1858 (Cuesta de Congo, San Miguel, *Wendland 772*). Wet forests, Atlantic coast to the Meseta Central and Cantón de Dota; mountains of Guanacaste; at 1,800 meters or less. Guatemala to Colombia. The fruiting spikes are white.

**Spathiphyllum fulvovirens** Schott, Oesterr. Bot. Zeitschr. 8: 179. 1858. Pedregal, *Wendland 939*. Endemic.

**Spathiphyllum laeve** Engler, Bot. Jahrb. 37: 120. 1905. Cocos Island, forests of Valle Gissler, *Pittier 12370*. Endemic.

**Spathiphyllum phryniifolium** Schott. Meseta Central, and without doubt also on the Atlantic coast, although I have seen no specimens from that region. Guatemala to Panama.

### STENOSPERMATION Schott

Epiphytic and usually scandent plants, the leaves petiolate, oblong-elliptic or lanceolate.

**Stenospermation angustifolium** Hemsl. Forests of Talamanca and Buenos Aires; San Ramón. Also in Nicaragua.

**Stenospermation marantaefolium** Hemsl. Forests of Tsaki, 200 meters. Also in Nicaragua.

**Stenospermation robustum** Engler, Bot. Jahrb. 37: 111. 1905. La Palma, 1,550 meters, *Tonduz 12447*. Common in wet forests of the volcanoes, extending to the Atlantic coast, at 200–1,600 meters. Also in Panama.

**Stenospermation sessile** Engler, Bot. Jahrb. 37: 111. 1905. La Palma, 1,550 meters, *Tonduz 12447*. Common in moist forests of the volcanoes, extending to the Atlantic tierra caliente; region of San Ramón; 200–1,600 meters. Also in Panama.

### SYNGONIUM Schott

Large, scandent epiphytes, the leaves parted in various ways.

**Syngonium Hoffmannii** Schott, Oesterr. Bot. Zeitschr. 8: 178. 1858. *Porphyrospatha Hoffmannii* Engler in DC. Monogr. Phan. 2: 291. 1879. Candelaria, *Hoffmann 616*. Meseta Central. Endemic. Leaves trisect; spathe white outside, pale purple within.

**Syngonium peliocladum** Schott, Prodr. 202. 1860. Type collected in Costa Rica by Wendland, without indication of the locality.

**Syngonium podophyllum** Schott. *S. Oerstedianum* Schott, Oesterr. Bot. Zeitschr. 8: 178. 1858 (Guanacaste, *Oersted*). *S. podophyllum* var. *Oerstedianum* Engler, Pflanzenreich IV. 23E: 129. 1920. Meseta Central and Cantón de Dota to the coasts, at 1,500 meters or less. Abundant in many localities. Widely dispersed in Central America. Leaves 5–7-parted; spathe green outside, white or pink within.

**Syngonium Rothschuhianum** Engler. Specimens collected on the Atlantic coast (Guápiles and Finca Montecristo) perhaps represent this species of Nicaragua.

**Syngonium Wendlandii** Schott, Oesterr. Bot. Zeitschr. 8: 178. 1858. Type collected in Costa Rica by Wendland, the exact locality unknown. Leaves trisect.

### UROSPATHA Schott

**Urospatha Tonduzii** Engler, Anal. Inst. Fís. Costa Rica 8: 364. 1895. Matina, *Pittier 10302*. Atlantic coast. A terrestrial plant. Endemic.

### XANTHOSOMA Schott

Terrestrial plants with rhizomes or tuberous roots, the stems elongate or none.

**Xanthosoma helleborifolium** (Jacq.) Schott. Meseta Central, and almost certainly in forests of the coasts. Leaves divided into 5–13 narrow segments. Extending to the West Indies and South America.

**Xanthosoma pilosum** C. Koch. Atlantic coast; region of San Ramón, at 700 meters. A large plant, the leaves ovate-sagittate, covered with fine, soft hairs. The leaves are glabrous in the other species listed here. The species ranges to Colombia.

**Xanthosoma roseum** Schott. *Pato, Pico de pato.* Meseta Central and Atlantic slope; Guanacaste. Abundant in many places, growing on stream banks or in swampy ground. Leaves ovate-sagittate, the blades often a meter long; stems sometimes 1–4 meters long, 10–20 cm. thick, and recumbent upon the ground; spathe large, white or pink. The plant is a conspicuous and rather handsome one, very abundant in some places, as in the vicinity of Cartago and Tilarán. Ranging to Mexico.

**Xanthosoma violaceum** Schott. *Tiquisque.* Cultivated commonly in many places, and naturalized in some localities, as about San José. A tall plant with broad leaves. It arises from a large, thick rhizome, which is edible when cooked. The plant is much cultivated in almost all tropical regions of the world, and it is not known just where it is native. In Panama it is well known by the name Otó. Among Indian names listed for it are: Bu-í (Cabécara); Bu-é (Bribrí); San (Brunka); Tis, Hako (Térraba); Piná (Guatuso). The species has been reported from Costa Rica as *X. sagittifolium* (L.) Schott, a species that may be in cultivation on the Atlantic coast among the Jamaican settlers.

**Xanthosoma Wendlandii** (Schott) Standl., comb. nov. *Comida de culebra. Acontias Wendlandii* Schott, Oesterr. Bot. Zeitschr. 8:

178. 1858; *A. Hoffmannii* Schott, Prodr. 196. 1860 (San José, *Hoffmann 612*); *X. Hoffmannii* Schott, Oesterr. Bot. Zeitschr. 15: 33. 1865; *X. Hoffmannii* var. *Wendlandii* Engler in Mart. Fl. Bras. 3, pt. 2: 191. 1878. Type collected in Costa Rica, without indication of the exact locality. Region of San Ramón, at 1,050 meters. Endemic. Leaves parted into 5–7 segments; berries yellow.

### ZANTEDESCHIA Spreng. Calla

**Zantedeschia aethiopica** (L.) Spreng. *Cala, Cartucho.* This beautiful plant, native of South Africa, is grown commonly in gardens, being in Costa Rica quite as popular a funeral flower as in the United States. The calla has become thoroughly naturalized in pastures of Irazú, where the great masses of large plants with their many white flowers provide a sight one is not likely to forget.

## LEMNACEAE. Duckweed Family

The plants of this family are the smallest phanerogams. They float upon the surface of quiet water, and consist of a small, green disk with or without rootlets, and with microscopic flowers, greatly reduced in structure. No doubt there exist in Costa Rica species of the genus *Lemna*, but I have seen no specimens. *Lemna* differs from *Spirodela* in having solitary rootlets.

### SPIRODELA Schleid.

**Spirodela polyrhiza** (L.) Schleid. Floating on quiet water, forming small or large colonies. The plant consists of an obovate disk only 2.5–4.5 mm. long with a few rootlets. A species of cosmopolitan distribution.

## MAYACACEAE. Mayaca Family

### MAYACA Aubl.

**Mayaca Aubleti** Michx. Buenos Aires, 480 meters. The only Central American member of the family, widely distributed in tropical America. A slender, aquatic plant, resembling a moss in general appearance; leaves linear, 4–6 mm. long; flowers very small, white.

## XYRIDACEAE. Yellow-eyed Grass Family

In Central America this family is represented by only the following genus.

### XYRIS L.

Annual or perennial herbs, acaulescent, the leaves linear, 2-ranked; scapes simple, terminated by a bracted head of inconspicu-

ous, small, yellow flowers that have a delicate and quickly fading perianth; fruit a 1-celled capsule.

**Xyris macrocephala** Vahl. Buenos Aires, 500 meters, and probably in other regions, growing in swampy places. Flower heads 1.5–2 cm. long, the scapes 60–90 cm. long.

**Xyris mexicana** Wats.(?). Laguna de La Chonta, Cantón de Dota, 2,000 meters, in sphagnum bogs, forming dense clumps. Ranging to Mexico. Flower heads 1 cm. long. It is not certain that the Costa Rican plant is properly referable to the Mexican species. It is, however, quite distinct from *X. Jupicai* L. Rich., a species that probably will be found in Costa Rica.

## ERIOCAULACEAE. Pipewort Family

Reference: W. Ruhland, Eriocaulaceae, Pflanzenreich IV. 30. 1903.

Annual or perennial herbs, acaulescent or with elongate stems, the leaves narrow and grass-like; flowers minute, arranged in dense, involucrate, whitish heads.

### ERIOCAULON L. Pipewort

**Eriocaulon microcephalum** HBK. Paramos of Cerro de Las Vueltas, 3,000 meters, common. Mexico and Ecuador; known in Central America only from Costa Rica. A perennial 1–3 cm. high, forming dense mats; leaves lance-linear, 1–2 cm. long; heads about 3 mm. broad.

### PAEPALANTHUS Mart.

**Paepalanthus costaricensis** Moldenke, ined. Laguna de La Chonta, Cantón de Dota, 2,000 meters, abundant in sphagnum bogs, *Standley 42326*. An Andean species, known in North America only from this locality. A perennial, forming dense clumps, the leaves 13–20 cm. long, 1.5–2.5 cm. wide; scapes elongate, the heads 1–2 cm. broad.

### SYNGONANTHUS Ruhland

**Syngonanthus caulescens** (Poir.) Ruhland. Cañas Gordas, 1,100 meters. A South American species, known in North America only from this locality. Stems 10–20 cm. long, densely leafy, the leaves linear, 1.5–3.5 cm. long; peduncles few or numerous, terminal; heads 3–5 mm. broad.

### TONINA Aubl.

**Tonina fluviatilis** Aubl. Río Ceibo, 200 meters. Widely distributed in tropical America. A plant of wet places, the stems

branched, leafy; leaves lanceolate or oblong, 8–15 mm. long; heads minute.

## BROMELIACEAE. Pineapple Family

*By Lyman B. Smith and Paul C. Standley*

Almost all the Costa Rican Bromeliaceae are epiphytes. The subfamily *Pitcairnioideae*, which contains almost a third of the species of this exclusively American family, is terrestrial, except for a few species of *Pitcairnia*, but this group is represented in Costa Rica only by one species of *Puya* and a few of *Pitcairnia*. The Bromeliaceae are well represented in Costa Rica, by a much greater number of species than in any other country of Central America, largely as a result of the collections of Wercklé, who gave much time to their study. The bromeliads are abundant in almost all parts of the country, especially at middle and high elevations. Because of their brightly colored inflorescences, some of them are very handsome and conspicuous plants.

### AECHMEA Ruiz & Pavón

**Aechmea angustifolia** Poepp. & Endl. *A. Cumingii* Baker. Atlantic coast, epiphytic. Extending to Brazil and Bolivia.

**Aechmea dactylina** Baker. Santo Domingo de Golfo Dulce; Puerto Jiménez. Also in Panama and Colombia.

**Aechmea Kienastii** E. Morren. *A. tillandsioides* as to Costa Rican specimens. San Juan. Extending to Mexico and Colombia.

**Aechmea magdalenae** André. *Pita, Pita floja. Ananas magdalenae* Standl. Common in wet forests of the Atlantic coast; also in Guanacaste and the region of San Ramón. Forming very extensive colonies (*pitales*) in some places. Extending to Mexico and Ecuador. In general appearance this terrestrial plant is similar to the pineapple. From its long, narrow leaves is obtained a fiber noted for its fineness and strength.

**Aechmea Mariae-Reginae** Wendl. Hamb. Gartenz. 9: 32. 1863. *Espíritu Santo, Corpus, Piña de palo.* A common and well known species of the tierra caliente, ascending almost to Cartago. Endemic. An epiphyte, sometimes growing upon the ground, probably where it has lodged after the host tree has fallen. A very large plant with dense, elongate flower spikes subtended at the base by long, soft, pendent bracts, which are tinted with the most lovely and delicate pink that it is possible to imagine. In beauty

it has few equals among the many beautiful flowers of Costa Rica, and it has few rivals even among the most showy orchids. Wercklé states that the fruiting spike sometimes weighs two kilograms, and that the fruit is good to eat. Illustrated, Curtis' Bot. Mag. *pl. 6441*.

**Aechmea mexicana** Baker. *A. Bernoulliana* Wittm. Cartago, Río Turrialba, and other regions, at 250–1,300 meters. Mexico to Ecuador.

**Aechmea nudicaulis** (L.) Griseb. Near Cartago (Mez), and Lago Bonilla near "Tunnel Camp," Prov. Limón, *Dodge 6079*. A species of wide distribution.

**Aechmea Pittieri** Mez in DC. Monogr. Phan. 9: 231. 1896. Boruca, *Tonduz 4830*. Also at Buenos Aires. Endemic.

**Aechmea pubescens** Baker. Common on the coasts, ascending to 600 meters. Colombia to Honduras.

**Aechmea Schultesiana** Mez. *A. Friedrichsthalii* Mez & Donn. Smith. Atlantic coast, at 300 meters or less. Also Venezuela, Hylaea, Peru.

**Aechmea Standleyi** Cufodontis, Archivio Bot. 9: 182. 1933. Finca Waldeck, 28 miles from Limón, *Cufodontis 719*. An endemic epiphyte.

**Aechmea Tonduzii** Mez & Pittier, Bull. Herb. Boiss. II. 3: 132. 1903. Alto del Pito, near San Marcos, 1,400 meters, *Tonduz 7684*. Endemic.

**Aechmea Veitchii** Baker. *Piñuela*. Valley of Tuis (Mez), Orosi, and other unspecified localities. Colombia.

### ANANAS Mill. Pineapple

**Ananas comosus** (L.) Merrill. *Piña*. *A. sativus* Schult. f. A Brazilian plant, the pineapple was introduced into Central America immediately after the Spanish conquest or perhaps even earlier. It is cultivated commonly in Costa Rica, not only throughout the tierra caliente but in regions of greater elevation. The pineapples of Turrialba are justly celebrated for their superior quality. The fruit has been grown for export on the Atlantic coast. The plant is naturalized in some localities. Among Indian names reported are: Karú-ru-buí (Cabécara); Amú (Bribrí); Boa-et (Brunka); Pong-uó (Térraba); Ki-kurú (Guatuso); Boat (Boruca); Surak (Rama).

## ANDROLEPIS Brongn.

**Androlepis Donnell-Smithii** (Baker) Mez. Canyon of Río Reventazón, Prov. Cartago, *Dodge 4864;* Capulín, Prov. Alajuela, *Standley 40183*. Also in Guatemala.

## ARAEOCOCCUS Brongn.

**Araeococcus pectinatus** L. B. Smith, Contr. Gray Herb. 95: 41. *pl. 11, f. 6*. 1931. Pozo Azul de Pirrís, 95 meters, *Lankester 1164*. Endemic. The only North American representative of this otherwise South American genus.

## BILLBERGIA Thunb.

**Billbergia macrolepis** L. B. Smith. *Billbergia pallidiflora* as to Costa Rican citations. Buenos Aires, Prov. Puntarenas, *Pittier 6608*. Described from Panama.

## BROMELIA L.

The members of this genus are terrestrial plants.

**Bromelia Pinguin** L. *Piñuela, Piñuela casera, Piro*. Abundant in dry forests of the Pacific coast, and often planted for hedges, its spiny leaves serving well to repel animals. From the leaves is obtained a strong fiber less fine than that of *Aechmea magdalenae*. The young inflorescence, prepared in various ways, is a vegetable of good flavor and quality. The yellow fruit is intensely acid, but is sometimes employed for preparing refreshing beverages. Native Indian names are: Amú (Bribrí); Bi-shkú (Térraba). Extending to Mexico, West Indies, and Guiana.

**Bromelia Wercklei** Mez, Repert. Sp. Nov. 16: 2. 1919. *Piñuela de garrobo, Piñuela de mico. B. Karatas* of some authors, not L. Forests of the Pacific tierra caliente. Also in Nicaragua, Salvador, and Mexico. Sometimes planted for hedges. The very acid fruit is employed for preparing beverages similar to lemonade.

## CATOPSIS Griseb.

Epiphytic and usually small plants.

**Catopsis apicroides** (Cham. & Schlecht.) Baker. *C. Schindleri* Mez & Wercklé, Bull. Herb. Boiss. II. 4: 1124. 1904 (without locality, *Wercklé 136*). *?C. tenuis* Cufodontis, Archivio Bot. 9: 181. 1933 (near Finca Waldeck, 28 miles from Limón, *Cufodontis 720*). Santiago, Prov. Cartago; El General, Prov. San José; Tucurrique, Prov. Cartago. Mexico to Panama.

**Catopsis brevifolia** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 1127. 1904. Without definite locality, *Wercklé 135*. Endemic.

**Catopsis floribunda** (Brongn.) L. B. Smith, Contr. Gray Herb. 117: 5. 1937. *Catopsis nutans* of some authors. Las Delicias, Prov. Guanacaste; Meseta Central and slopes of Volcán de Poás. Southern Florida, British Honduras, West Indies, Venezuela.

**Catopsis juncifolia** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 1124. 1904. Without exact locality, *Wercklé 133*. Endemic.

**Catopsis Morreniana** Mez. *C. Bakeri* Mez. Los Ayotes, Guanacaste. Extending to Mexico.

**Catopsis nitida** (Hook.) Griseb. Cartago, San Ramón (Mez). Honduras, West Indies, Guiana.

**Catopsis nutans** (Swartz) Griseb. *C. vitellina* Link, Kl. & Otto; *C. fulgens* Griseb. (Cf. Contr. Gray Herb. 117: 7. 1937). A common species of the Meseta Central and Pacific coast; Pejivalle; ascending to 1,500 meters. Cuba, Jamaica, Mexico to Ecuador.

**Catopsis pendula** Baker. Near Cartago, *Maxon 67*. Mexico, Guatemala.

**Catopsis pusilla** Mez & Wercklé, Repert. Sp. Nov. 14: 248. 1916. Navarro, 1,400 meters, *Wercklé*. Also near Cartago and slopes of Barba and Poás. Endemic.

**Catopsis sessiliflora** (Ruiz & Pavón) Mez. *C. nutans* var. *erecta* Wittm. Bot. Jahrb. 11: 71. 1889 (near Cartago, *Lehmann 1088*). Common in the Meseta Central and on slopes of the volcanoes, ascending to 1,800 meters; Atlantic coast and in Guanacaste. Mexico to Brazil and Peru.

**Catopsis Wangerini** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 1126. 1904. Near Cartago, *Wercklé 105*. Also Candelaria. Endemic.

**Catopsis Werckleana** Mez, Bull. Herb. Boiss. II. 4: 1125. 1904. Near Tucurrique, 800 meters, *Wercklé 65*. Endemic.

### GRAVISIA Mez

**Gravisia aquilega** (Salisb.) Mez. *Aechmea aquilegioides* Kuntze, Rev. Gen. 2: 698. 1891. Angostura, *Kuntze*. The genus is a South American one, otherwise unknown in North America. The present species ranges from Jamaica and Trinidad to Brazil.

## GREIGIA Regel

**Greigia sylvicola** Standl. Journ. Wash. Acad. Sci. 17: 160. 1927. Forests near Laguna de La Escuadra, northeast of El Copey, 2,200 meters, *Standley 41975*. Known only from mountains of Cantón de Dota, 2,100–3,000 meters. Endemic. A slender, terrestrial plant, 1–1.5 meters high. Otherwise the genus is confined to the Andean region of South America.

## GUZMANIA Ruiz & Pavón

Reference: L. B. Smith, Provisional key to the genus *Guzmania*, with notes on new or critical species, Contr. Gray Herb. 98: 18–34. 1932.

The members of the genus are epiphytic plants.

**Guzmania angustifolia** (Baker) Wittmack. Wet forest, 800–1,800 meters. Bracts colored with an intense red. Ranging to Ecuador.

**Guzmania compacta** Mez. *G. capitulata* Mez & Wercklé, Repert. Sp. Nov. 14: 255. 1916 (La Palma, *Wercklé 17288*). Also in Nicaragua.

**Guzmania condensata** Mez & Wercklé, Bull. Herb. Boiss. II. 3: 228. 1903. Vicinity of Cartago, 1,200–1,600 meters, *Wercklé 16198*. Tapantí, 1,200 meters, *M. Valerio 1439*. Endemic.

**Guzmania coriostachya** Griseb. *G. strobilifera* Mez & Wercklé, Bull. Herb. Boiss. II. 5: 110. 1905 (without exact locality, *Wercklé 78*). Also at El Muñeco. Colombia, Venezuela.

**Guzmania costaricensis** Mez & Wercklé, Repert. Sp. Nov. 16: 78. 1919. Las Cóncavas, Prov. Cartago, *Wercklé 132*. Endemic.

**Guzmania crateriflora** Mez & Wercklé, Bull. Herb. Boiss. II. 5: 110. 1905. Without exact locality, *Wercklé 84*. Cocos Island. Endemic.

**Guzmania dissitiflora** (André) L. B. Smith. *Sodiroa dissitiflora* André. Cascajal and La Hondura, 1,300–1,700 meters. Also in Colombia.

**Guzmania Donnellsmithii** Mez, Bot. Gaz. 35: 9. 1903. *Schlumbergeria Donnellsmithii* Harms in Engl. Pflanzenfam. ed. 2. 15a: 129. 1930. Forests of Suerre, Llanuras de Santa Clara, 300 meters, *J. D. Smith 6842*. La Tejona, north of Tilarán, Guanacaste, 600–700 meters, *Standley & Valerio 46067*.

**Guzmania glomerata** Mez & Wercklé, Repert. Sp. Nov. 14: 256. 1916. La Palma, *Wercklé*. Endemic.

**Guzmania lingulata** (L.) Mez. Near Turrialba, *Wercklé 85* (Mez). West Indies and Nicaragua to Brazil and Bolivia.

**Guzmania minor** Mez. Cartago; Atlantic coast; mountains of Guanacaste; up to 1,400 meters. Nicaragua to Amazonian Brazil.

**Guzmania monostachia** (L.) Rusby. Near Cartago; El Arenal, Guanacaste; San Ramón (Mez). Florida and West Indies to Bolivia.

**Guzmania nicaraguensis** Mez & C. F. Baker. Tucurrique, *Tonduz 13291*. Without exact locality, *Wercklé*. Guatemala, Nicaragua.

**Guzmania obtusiloba** L. B. Smith. *Sodiroa Andreana* Wittm., non *Guzmania Andreana* Mez. La Hondura de San José, *M. Valerio 702*. A Colombian species, known in North America only from this locality.

**Guzmania patula** Mez & Wercklé, Repert. Sp. Nov. 14: 255. 1916. Navarro, *Wercklé*. Colombia.

**Guzmania plicatifolia** L. B. Smith, Proc. Amer. Acad. 68: 146. *pl. 2, f. 4, 5*. 1933. La Palma, 1,500 meters, *Tonduz 12533*. Jocosal near Cartago, *Lankester;* San Ramón. Endemic.

**Guzmania polycephala** Mez & Wercklé, Repert. Sp. Nov. 14: 254. 1916. La Palma, 1,500 meters, *Wercklé*. Collected near Cartago by Lankester. Panama.

**Guzmania Scherzeriana** Mez in DC. Monogr. Phan. 9: 949. 1896. Vicinity of Cartago, 1,700 meters, *Scherzer*. Collected at Las Cóncavas by Wercklé (Mez).

**Guzmania stenostachya** L. B. Smith, Contr. Gray Herb. 117: 9. 1937. Yerba Buena, northeast of San Isidro, Prov. Heredia, 2,000 meters, *Standley & Valerio 50174*. Also San Gerónimo, Prov. Cartago. Endemic.

**Guzmania strobilifera** Mez & Wercklé, Bull. Herb. Boiss. II. 5: 110. 1905. Without exact locality, *Wercklé 78*. Also at El Muñeco. Endemic.

**Guzmania subcorymbosa** L. B. Smith, Contr. Gray Herb. 117: 10. 1937. El Arenal, Guanacaste, 600 meters, *Standley & Valerio 45110*. Also Naranjos Agrios. Panama, Colombia.

## PITCAIRNIA L'Hér.

**Pitcairnia atrorubens** (C. Koch) Baker. Wet forests of the Atlantic slope. A terrestrial plant, about a meter high. Also in Panama.

**Pitcairnia Brittoniana** Mez. *P. flaviflora* Standl. Journ. Wash. Acad. Sci. 17: 247. 1927 (La Palma, Prov. San José, 1,600 meters, *Standley 33091*). Also region of San Ramón, at 950 meters. Plants either terrestrial or epiphytic. Extending to Bolivia.

**Pitcairnia heterophylla** (Lindl.) Beer. *Broma, Broma real.* Meseta Central, Cantón de Dota, Guanacaste, and probably in many other regions. Mexico to Ecuador. A terrestrial or epiphytic plant, sometimes growing upon rocks, the bases of the leaves furnished with sharp and dangerous spines; flowers pink. Pittier states that an infusion of the leaves is considered a sovereign remedy for dysentery.

**Pitcairnia maidifolia** (E. Morr.) Dcne. *P. Oerstediana* Mez in DC. Monogr. Phan. 9: 448. 1896 (Ujarrás, *Oersted 44*). Río Virilla and Cabeceras; San Ramón, at 1,200 meters. Also in Colombia and Venezuela.

**Pitcairnia membranifolia** Baker, Handb. Bromel. 109. 1889. Quebrada Honda, *Hoffmann 657*. Endemic.

**Pitcairnia oblanceolata** L. B. Smith, Contr. Gray Herb. 117: 26. 1937. Cataracts of San Ramón, *Brenes 13512*. Endemic.

**Pitcairnia Theae** Mez in DC. Monogr. Phan. 9: 376. 1896. Forests near Boruca, *Pittier 6868*. Endemic.

**Pitcairnia Valerii** Standl. Journ. Wash. Acad. Sci. 17: 246. 1927. La Hondura, Prov. San José, 1,500 meters, *Juvenal Valerio 51879*. Region of San Ramón, at 1,100 meters. A terrestrial plant. Endemic.

**Pitcairnia Wendlandi** Baker. *P. sulfurea* Mez, non Andr. La Palma de San Ramón, *Brenes 5600*. Guatemala (?).

**Pitcairnia Werckleana** Mez, Bull. Herb. Boiss. II. 4: 622. 1904. Without exact locality, *Wercklé 108*. Endemic.

## PUYA Molina

**Puya dasylirioides** Standl. Journ. Wash. Acad. Sci. 17: 159. 1927. Laguna de La Chonta, northeast of Santa María de Dota,

Prov. San José, 2,100 meters, *Standley 42334*. Cerro de Las Vueltas and Cerro de La Muerte, ascending to 3,000 meters or more. A terrestrial plant, 1–2.5 meters high; margins of the leaves furnished with short, sharp spines. The only North American species of the genus, which is a characteristic group of the Andean paramos. The old, dried stalks, as they appeared through the meadows where the type was collected, reminded the collector strongly of mullein stalks.

## THECOPHYLLUM André

A genus of epiphytic plants.

**Thecophyllum acuminatum** L. B. Smith, Contr. Gray Herb. 117: 30. 1937. Epiphytic, La Palma, Prov. San José, 1,600 meters, *Standley 38276*. Also La Hondura. Endemic.

**Thecophyllum angustum** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 1121. 1904. Without definite locality, *Wercklé 88*. Collected also at Carillo. Endemic.

**Thecophyllum balanophorum** Mez, Bull. Herb. Boiss. II. 3: 131. 1903. *Guzmania balanophora* Mez in DC. Monogr. Phan. 9: 918. 1896. Volcán de Irazú, *Oersted 22*. Collected also by Wercklé, without definite locality. Endemic.

**Thecophyllum bracteosum** Mez & Wercklé, Repert. Sp. Nov. 14: 246. 1916. La Palma, 1,500 meters, *Wercklé 17921*. Endemic, and known only from the region of La Palma.

**Thecophyllum capitatum** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 873. 1904. Without definite locality, *Wercklé 86*. Endemic.

**Thecophyllum comatum** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 871. 1904. Near Turrialba, 900 meters, *Wercklé*. Endemic.

**Thecophyllum crassiflorum** Mez & Wercklé, Bull. Herb. Boiss. II. 3: 138. 1903. Cartago, 1,200–1,400 meters, *Wercklé 16188*. Endemic.

**Thecophyllum discolor** Mez & Wercklé, Repert. Sp. Nov. 14: 246. 1917. Without definite locality, *Wercklé*. Endemic.

**Thecophyllum insigne** (E. Morr.) Mez. *Guzmania insignis* Mez. Either epiphytic or terrestrial, abundant on the slopes of the central volcanoes; San Ramón. Conspicuous because of its red bracts. The plant is employed commonly for ornament in gardens and on altars, and is often seen in hanging baskets in the city of San José. Also in Panama.

**Thecophyllum irazuense** Mez & Wercklé, Bull. Herb. Boiss. II. 3: 138. 1903. Volcán de Irazú, *Wercklé 15206*. Also Las Pacayas de Cartago; Cerro de La Carpintera. Endemic.

**Thecophyllum latissimum** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 1122. 1904. Without definite locality, *Wercklé 82*. Endemic.

**Thecophyllum laxum** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 1123. 1904. Without definite locality, *Wercklé 90*. La Hondura, Prov. San José, *Standley & Valerio 51912*. Endemic.

**Thecophyllum lineatum** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 875. 1904. Cartago, 1,200–1,600 meters, *Wercklé 16207*. Also at Cascajal, *Lankester K256;* Cerro de Las Caricias and Cerro de Las Lajas, north of San Isidro, Prov. Heredia. Endemic.

**Thecophyllum orosiense** (*"ororiense"*) Mez, Bull. Herb. Boiss. II. 3: 131. 1903. *Guzmania ororiense* Mez in DC. Monogr. Phan. 9: 917. 1896. Orosi, *Oersted 25*. Also on Barba (*Mez*) and on Irazú, at 2,200 meters. Endemic.

**Thecophyllum panniculatum** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 1123. 1904. La Palma, 1,500 meters, *Wercklé 55*. Endemic.

**Thecophyllum pedicellatum** Mez & Wercklé, Bull. Herb. Boiss. II. 3: 136. 1903. Cartago, 1,200–1,600 meters, *Wercklé 16197*. Also Laguna de La Chonta, near Santa María de Dota; Cerro de La Carpintera. The species has been collected in Nicaragua.

**Thecophyllum pictum** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 874. 1904. Desengaño, 1,460 meters, *Wercklé 119*. Endemic.

**Thecophyllum Pittieri** Mez, Bull. Herb. Boiss. II. 3: 137. 1903. La Palma, 1,500 meters, *Tonduz 12526*. Cartago (*Mez*); San Jerónimo; Yerba Buena. Endemic.

**Thecophyllum rubrum** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 878. 1904. Type *Wercklé 100*, without locality. Endemic.

**Thecophyllum singuliflorum** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 870. 1904. Type *Wercklé 89*, without locality. Endemic.

**Thecophyllum spectabile** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 873. 1904. Type collected by Wercklé, without locality. Endemic.

**Thecophyllum Standleyi** L. B. Smith, Contr. Gray Herb. 117: 30. *pl. 2, f. 30–31*. 1937. Epiphytic, Cerro de Las Vueltas, Prov. San José, 3,000 meters, *Standley & Valerio 43573*. Endemic.

**Thecophyllum stenophyllum** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 875. 1904. Type *Wercklé 112*, without locality. Endemic.

**Thecophyllum turbinatum** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 1122. 1904. Type *Wercklé 116*, without locality. Endemic.

**Thecophyllum violascens** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 877. 1904. La Palma, 1,500 meters, *Wercklé 43*. Viento Fresco, Prov. Alajuela, *Standley & Torres 48020*. Endemic.

**Thecophyllum viride** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 872. 1904. Type collected by Wercklé, without locality. Irazú, *Standley 36631*. Endemic.

**Thecophyllum vittatum** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 871. 1904. Type *Wercklé 79*, without locality. Endemic.

**Thecophyllum Werckleanum** Mez, Bull. Herb. Boiss. II. 3: 139. 1903. Cartago, at 1,200–1,400 meters, *Wercklé 16201*. Endemic.

## TILLANDSIA L.

This genus is exceptionally well represented in Costa Rica. The plants often occur in great abundance, and are found nearly everywhere, from the coasts almost to the summits of the highest volcanoes.

**Tillandsia Acostae** Mez & Tonduz, Repert. Sp. Nov. 14: 252. 1916. Forests of Cerros de Tremendales, near San Ramón, *Tonduz 17891; Brenes 20573*. Endemic.

**Tillandsia adpressa** André, var. **orthiantha** (Standl.) L. B. Smith, Contr. Gray Herb. 89: 9. 1930. *T. orthiantha* Standl. Journ. Wash. Acad. Sci. 17: 248. 1927. Laguna de La Chonta, near Santa María de Dota, 2,000 meters, *Standley 42312*. The typical form of the species occurs in Ecuador.

**Tillandsia adpressa** André, var. **Tonduziana** (Mez) L. B. Smith, Contr. Gray Herb. 89: 8. 1930. *T. Tonduziana* Mez, Bot. Jahrb. 30: Beibl. 67: 9. 1901. Meseta Central. Also Colombia.

**Tillandsia anceps** Lodd. *Vriesia Schlechtendalii* var. *alba* Wittm. Bot. Jahrb. 11: 69. 1889 (Cartago, *Lehmann 1188*). Cartago and Guanacaste. Ranging to Trinidad, Guiana, and Colombia.

**Tillandsia Andrieuxii** (Mez) L. B. Smith. *T. Benthamiana* var. *Andrieuxii* Mez (cf. Contr. Gray Herb. 117: 31. 1937). Cachí, *Lankester*. Mexico. Illustrated, Curtis' Bot. Mag. *pl. 8576*.

**Tillandsia Balbisiana** Schult. f. *T. Urbaniana* Wittm. Bot. Jahrb. 11: 65. 1889 (Cartago, 1,500 meters, *Lehmann 1771*). Collected also by Oersted, without locality (Mez). Extending to Mexico, Florida, West Indies, and Venezuela.

**Tillandsia biflora** Ruiz & Pavón. Quebradillas, near Santa María de Dota, 1,800 meters, *Standley 43073;* also near El Copey. Extending to Venezuela and Bolivia.

**Tillandsia brachycaulos** Schlecht. *T. cryptantha* Baker; *T. Bradeana* Mez & Tonduz, Repert. Sp. Nov. 14: 252. 1916 (near San José, *Wercklé 37, 16414*). Near Cartago, Bahía de Salinas, Tilarán, and Río Virilla near El Brasil. Panama to Mexico.

**Tillandsia bulbosa** Hook. Common on the coasts. Widely distributed in tropical America.

**Tillandsia Butzii** Mez. *T. variegata* Schlecht., non Vell. Region of Cartago. Extending to Mexico. Inflorescence of a handsome, dark red that contrasts with the brilliant violet corollas.

**Tillandsia caput-medusae** E. Morren. Meseta Central to the Pacific coast. Ranging to Mexico. Bracts bright red.

**Tillandsia cauliflora** Mez & Wercklé, Bull. Herb. Boiss. II. 5: 100. 1905. Type *Wercklé 68*, without locality. Endemic.

**Tillandsia chontalensis** Baker. *T. spuria* Mez & Wercklé, Repert. Sp. Nov. 16: 74. 1919 (collected at Las Cóncavas, near Cartago, by Wercklé). Also San Jerónimo, El Muñeco, and El General. Nicaragua and reported from Panama.

**Tillandsia complanata** Benth. Region of Cartago. Extending to Bolivia and West Indies.

**Tillandsia compressa** Bert. Near Cartago and San José (Mez). Extending to Jamaica and Surinam.

**Tillandsia contorta** Mez & Pittier, Bull. Herb. Boiss. II. 3: 224. 1903. Tuis, *Pittier 11376*. Endemic.

**Tillandsia cyanea** (A. Dietr.) E. Morren. Collected by Hoffmann (Mez), without indication of the locality. La Palma, Tucurrique (Mez). Extending to Guatemala.

**Tillandsia excelsa** Griseb. *T. costaricana* Mez & Wercklé, Bull. Herb. Boiss. II. 3: 143. 1903. *T. costarricensis* Mez & Wercklé ex Wercklé, Subreg. Fiteogr. Costar. 33. 1909, nomen. Near Cartago, 1,200–1,400 meters, *Wercklé 16180*. Also at Tuis, La Hondura, and

La Palma. The pale red bracts contrast with the corollas which, as in other species, are violet. Central America, Cuba, Jamaica.

**Tillandsia fasciculata** Swartz. Pejivalle, Santa María de Dota, and in other regions. Colombia and Guiana to Mexico, West Indies, and Florida.

**Tillandsia festucoides** Brongn. Talamanca, Candelaria (Mez); Tucurrique; Turrialba; Hamburg Farm, Prov. Limón. Central America, West Indies, Florida.

**Tillandsia filifolia** Schlecht. & Cham. Tucurrique and Pejivalle. Extending to Mexico.

**Tillandsia guanacastensis** Standl. Journ. Wash. Acad. Sci. 17: 247. 1927. Moist forest, La Tejona, north of Tilarán, Guanacaste, 650 meters, *Standley & Valerio 46045*. Also at Naranjos Agrios in the same region; region of San Ramón, at 1,050 meters. Endemic.

**Tillandsia incurva** Griseb. *T. digitata* Mez in DC. Monogr. 9: 715. 1896 (based upon plants cultivated in Europe, of Costa Rican origin). *T. castaneo-bulbosa* Mez & Wercklé, Bull. Herb. Boiss. II. 3: 140. 1903 (near Cartago, 1,200–1,400 meters, *Wercklé 16189*). Common about Cartago; also slopes of Barba, and Santa María de Dota. Extending to Cuba and Bolivia.

**Tillandsia juncea** (Ruiz & Pav.) Le Conte. Common from the Atlantic coast to the Meseta Central and slopes of the volcanoes; also in Guanacaste, and probably throughout the Pacific coast. Florida to Bolivia.

**Tillandsia Leiboldiana** Schlecht. *T. Aschersoniana* Wittm. Bot. Jahrb. 11: 68. 1889 (Turrialba, 800 meters, *Lehmann 1810*); *T. lilacina* Mez. A handsome and showy plant with red bracts and violet corollas, common in the Meseta Central, on the slopes of the volcanoes, and in Guanacaste. Panama to Mexico.

**Tillandsia longifolia** Baker. Quebradillas, north of Santa María de Dota, 1,800 meters, *Standley 43065*. Venezuela.

**Tillandsia Makoyana** Baker. *T. cucaensis* Wittm. Forests of Nicoya, *Tonduz 13647*. Also in Guatemala and Honduras.

**Tillandsia melanocrater** L. B. Smith, Contr. Gray Herb. 117: 31. *pl. 2, f. 34*. 1937. *T. melanopus* E. Morr. ex Mez in part. Frequent in the Meseta Central; El Muñeco and Guanacaste. Extending to Mexico.

**Tillandsia monadelpha** (E. Morr.) Baker. *T. monobotrya* Mez, Repert. Sp. Nov. 16: 77. 1919. Common on the coasts, ascending to the Meseta Central. Guatemala to Guiana and Ecuador.

**Tillandsia multicaulis** Steud. *Chirra. T. caespitosa* Cham. & Schlecht., non Le Conte. Common in the Meseta Central, on slopes of the volcanoes, at 1,100–1,800 meters, and in Santa María de Dota. Panama to Mexico. Inflorescences bright red, very showy.

**Tillandsia pruinosa** Swartz. *Wercklé*, without locality (*Mez*); Atlantic coast, Las Cóncavas, Pejivalle, and Guanacaste. Extending to Mexico, West Indies, and Brazil.

**Tillandsia punctulata** Cham. & Schlecht. *T. melanopus* E. Morr. ex Mez, typical. Meseta Central and slopes of the volcanoes, ascending to 1,800 meters. Extending to Mexico and Surinam.

**Tillandsia rubra** Ruiz & Pavón, var. **costaricensis** Mez, Pflanzenreich IV. 32: 458. 1935. *T. paniculata* Cham. & Schlecht. var. *costaricensis* Mez in DC. Monogr. Phan. 9: 703. 1896. Orosi (where the type of the variety was collected by Oersted) and Cartago. Extending to the West Indies and Bolivia.

**Tillandsia Schiedeana** Steud. *T. vestita* Cham. & Schlecht., non Willd. Meseta Central to the Pacific coast. Venezuela to West Indies and Mexico.

**Tillandsia singularis** Mez & Wercklé, Bull. Herb. Boiss. II. 5: 103. 1905. Type *Wercklé 76*, without locality. Also Pejivalle and mountains of Guanacaste. Endemic.

**Tillandsia spiculosa** Griseb. var. **palmana** (Mez) L. B. Smith, Contr. Gray Herb. 89: 14. 1930. *T. palmana* Mez, Bot. Jahrb. 30: Beibl. 67: 9. 1901. La Palma, 1,500–1,700 meters, *Tonduz 9710*. Also in the regions of Cartago, El Muñeco, and Pejivalle. Endemic. The typical form of the species is Venezuelan.

**Tillandsia tricolor** Cham. & Schlecht. Collected by Oersted and by Wercklé without indication of the locality (*Mez*). Ranging to Mexico.

**Tillandsia usneoides** L. *Barba de viejo.* Common in almost all regions from the coasts to the Meseta Central. In habit and general appearance quite unlike other species of the genus, the long. slender stems pendent in dense tufts from the branches of trees, A plant of wide distribution, from Virginia to Argentina. In the

United States the black fiber obtainable from the stems is employed commercially for making mattresses of high quality. In Arenal, Costa Rica, where the plant is called Barbasco, it is employed for stuffing pillows.

**Tillandsia Valenzuelana** A. Rich. *T. polystachya* L. var. *alba* Wittm. Bot. Jahrb. 11: 65. 1889 (Turrialba, 800 meters, *Lehmann 1114*). *T. Purpusii* Mez. Tucurrique, at 1,000 meters; Meseta Central, Guanacaste, and Atlantic coast. Colombia and Venezuela to Florida.

**Tillandsia venusta** Mez & Wercklé, Bull. Herb. Boiss. II. 5: 108. 1905. Turrialba, 600 meters, *Wercklé 95*.

**Tillandsia Werckleana** Mez, Bull. Herb. Boiss. II. 3: 144. 1903. Cartago, 1,200–1,600 meters, *Wercklé 16194*. Endemic.

## VRIESIA Lindl.

**Vriesia acuminata** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 868. 1904. Type *Wercklé 117*, without locality. Endemic.

**Vriesia brachyphylla** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 869. 1904. La Palma, 1,500 meters, *Wercklé 66*. Endemic.

**Vriesia Brunei** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 865. 1904. Candelaria, *Brune* (*Wercklé 45*). Also at Aserrí and in Cantón de Dota. Endemic.

**Vriesia camptoclada** Mez & Wercklé, Repert. Sp. Nov. 14: 247. 1916. La Palma, *Wercklé 17292*. Endemic.

**Vriesia diminuta** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 869. 1904. Type *Wercklé 118*, without locality. Meseta Central and slopes of the volcanoes, ascending to 2,000 meters. Endemic.

**Vriesia gladioliflora** (Wendl.) Ant. Wien. Ill. Gartenz. 5: 97. 1880. *Tillandsia gladioliflora* Wendl. Hamb. Gartenz. 19: 31. 1863. Common in mountains of the Meseta Central; also San Ramón, Cantón de Dota, and mountains of Guanacaste. Panama. Because of its beauty, it has been introduced into cultivation in Europe.

**Vriesia graminifolia** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 868. 1904. Type *Wercklé 92*, without locality. Endemic.

**Vriesia heliconioides** (HBK.) Hook. *V. disticha* auct., non *Renealmia disticha* L. Atlantic coast and San José. Guatemala to Bolivia.

**Vriesia Jimenezii** Mez & Wercklé, Repert. Sp. Nov. 14: 246. 1916. Cerros de Tremendales, near San Ramón, 1,300–1,400 meters, *Tonduz 17899*. Endemic.

**Vriesia macrantha** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 867. 1904. Type collected by Wercklé, without locality. Endemic.

**Vriesia macrochlamys** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 865. 1904. Type *Wercklé 115*, without locality. Endemic.

**Vriesia pachyspatha** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 867. 1904. Type *Wercklé 120*, without locality. Endemic.

**Vriesia Pittieri** Mez, Bull. Herb. Boiss. II. 3: 135. 1903. Forests of Santa Clara del Copey, 2,600 meters, *Pittier 12229*. Known from various localities in Cantón de Dota. Endemic.

**Vriesia rugosa** Mez & Wercklé, Bull. Herb. Boiss. II. 4: 866. 1904. Guardo Arias, *Wercklé*. Also La Palma. Endemic.

**Vriesia sanguinolenta** Cogn. & March. *V. Alfarovii* Mez, Repert. Sp. Nov. 14: 247. 1916. Santo Domingo de Golfo Dulce, *Tonduz 9883*. Cuba, Panama, Colombia.

**Vriesia subsecunda** Wittm. Bot. Jahrb. 11: 69. 1889. *Tillandsia subsecunda* Baker, Handb. Bromel. 217. 1889. Río Sucio, 400 meters, *Lehmann 1775*. Also near Cartago. Endemic.

**Vriesia viridiflora** (Regel) Wittm. *V. viminalis* E. Morr. Belg. Hort. 28: 257. *pl. 14, 15*. 1878. *Tillandsia viminalis* Hemsl. Biol. Centr. Amer. Bot. 3: 323. 1884. Volcán de Irazú, *Wendland* (fide Hemsley). Introduced into cultivation in Europe. Endemic.

**Vriesia Werckleana** Mez, Bull. Herb. Boiss. II. 3: 136. 1903. Cartago, 1,200–1,600 meters, *Wercklé 16210*. Endemic.

### WITTMACKIA Mez

**Wittmackia lingulata** (L.) Mez. *W. odora* Mez. Collected by Oersted (No. 24), without locality (fide Mez). Extending to West Indies and Brazil.

## COMMELINACEAE. Dayflower Family

### ATHYROCARPUS Schlecht.

**Athyrocarpus leiocarpus** (Benth.) Benth. & Hook. Meseta Central; Guanacaste; San Ramón; 500–1,400 meters, growing usually in wet forest. Plants branched and more or less scandent, the leaves

ovate or oblong-lanceolate; flowers blue; fruits dark blue. In general appearance the species of this genus are similar to *Commelina*.

**Athyrocarpus persicariifolius** (DC.) Hemsl. Wet forests, mountains of Guanacaste and Atlantic slope; region of San Ramón. Leaves lanceolate, pilose; fruits white.

**Athyrocarpus rufipes** (Seub.) Standl. Growing in wet places of the coasts. A species of wide distribution in South America. Spathes covered with ferruginous hairs.

## CALLISIA L.

**Callisia monandra** (Sw.) Schult. Wet forests or shaded places, Meseta Central to the coasts; common in many localities; region of San Ramón. A small, creeping plant, the leaves ovate, 2–4 cm. long; flowers small, white, in small umbels which are either solitary and lateral or arranged in terminal panicles.

**Callisia repens** L. Meseta Central, and probably in other regions of less elevation; sometimes growing in small deposits of earth on tree trunks, although not a true epiphyte. Widely distributed in tropical America. In this species the pedicels are short and scarcely exserted from the leaf sheaths; in *C. monandra* they are long-exserted.

## CAMPELIA L. Rich.

**Campelia Zanonia** (L.) HBK. *Cañutillo*. Common in wet forests, Meseta Central to the coasts; also slopes of the volcanoes, ascending to 2,000 meters. Widely distributed in tropical America. A fleshy, branched plant as much as 2 meters high, the leaves lanceolate, pilose on the lower surface; flowers white.

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Wercklé has published the following statement: "In the mountains south of Turruvares a gigantic *Cochliostema* is abundant, and covers the thick trunks of the trees. It is a very beautiful epiphyte." He reports it also from the Cordillera de Dota, as a plant 2 meters in height. The genus is known only from Ecuador, but probably it is represented also in Costa Rica.

## COMMELINA L. Dayflower

Succulent herbs; inflorescence of a few flowers enclosed in a compressed spathe.

**Commelina diffusa** Burm. f. *C. longicaulis* Jacq. Meseta Central to the coasts, common in waste places. Generally dis-

tributed in tropical regions. The species has been cited for Costa Rica as *C. nudiflora* L. For a discussion of the nomenclature of this species see Merrill, Journ. Arn. Arb. 18: 64. 1937.

**Commelina elegans** HBK. Meseta Central to the coasts, abundant in wet forests and waste places, often invading cultivated ground. A prostrate plant, the leaves lanceolate or ovate-oblong; petals blue. This species has been reported from Costa Rica under the name *C. virginica* L. The flowers, like those of most other members of the family, soon wither when exposed to bright sunlight.

**Commelina monticola** Seub. *C. monticola* var. *vestita* C. B. Clarke. The variety was cited from Costa Rica (*Hoffmann 398* in part) by Clarke. I have seen no specimens from the region. The species is widely distributed in South America.

**Commelina pallida** Willd. Reported for Costa Rica, the exact locality not indicated. A species of Mexico and Guatemala.

**Commelina quitensis** Benth. var. **cardiosepala** (Kuntze) C. B. Clarke. Reported for Costa Rica (*Hoffmann 398* in part) by Clarke, without mention of a definite locality. The species is South American.

## DICHORISANDRA Mikan

**Dichorisandra hexandra** (Aubl.) Standl. *D. Aubletiana* Roem. & Schult. Abundant in many parts of the tierra caliente, growing in wet forest. Widely dispersed in tropical America. A coarse, fleshy plant, 1–2 meters high, the lanceolate leaves 6–20 cm. long, almost glabrous; flowers purple.

## FLOSCOPA Lour.

**Floscopa Clarkeana** Kuntze, Rev. Gen. 2: 720. 1891. Cartago, *Kuntze*. Endemic. Common in wet forests of the Atlantic coast. Flowers arranged in dense panicles, very densely covered with purple hairs, the petals white. The only North American species of a genus well represented in South America and in tropical Africa. It does not extend north of Costa Rica. The Costa Rican plant has been referred to *F. robusta* (Seub.) C. B. Clarke.

## LEPTORRHOEO C. B. Clarke

The genus consists of a single species.

**Leptorrhoeo filiformis** (Mart. & Gal.) C. B. Clarke. Carrillos de Poás, *Quirós 554*. Mexico to South America. Plants almost

glabrous, the slender, branched stems 5–20 cm. long; leaves oblong or linear, 1–4 cm. long, sessile; flowers blue, very small, in 3–6-flowered, pedunculate, axillary and terminal umbels.

## RHOEO Hance

**Rhoeo discolor** (L'Hér.) Hance. *Pluma Venus.* Río Hondo, 100 meters. Often grown in gardens as an ornamental plant. Native of the Yucatan Peninsula, and probably introduced into Costa Rica. A glabrous perennial, the leaves strap-shaped, 10–20 cm. long, purple beneath; flowers white, enclosed by two concave bracts. In Honduras this plant is known by the picturesque and appropriate name of Señoritas embarcadas.

## TINANTIA Scheidw.

**Tinantia erecta** (Jacq.) Schlecht. Wet forests or other shaded places, Meseta Central and regions of middle elevation, at 900–1,800 meters. Widely distributed in tropical America. Probably annual, erect, branched, as much as a meter high, with broad leaves; flowers blue, in umbels. Calyx pilose.

**Tinantia leiocalyx** C. B. Clarke. Guanacaste, in wet forest. Ranging to Mexico. Calyx glabrous.

## TRADESCANTIA L.

**Tradescantia amplexicaulis** Klotzsch. Reported for Costa Rica (*Hoffmann*) by Clarke, without definite locality. Ranging to Mexico.

**Tradescantia commelinoides** Roem. & Schult. Wet forests, slopes of the higher mountains, at 1,000–2,000 meters; region of San Ramón, at 1,100 meters. Petals bright pink.

**Tradescantia cordifolia** Swartz. Cantón de Dota, 1,600 meters. A small, prostrate plant with ovate leaves; petals white. Widely distributed in tropical America.

**Tradescantia cumanensis** Kunth. Wet places, usually in forest, chiefly on the Atlantic coast, but also in regions of greater elevation. Widely distributed in tropical America. Flowers small, the petals either white or pink.

**Tradescantia disgrega** Kunth. Meseta Central to the coasts. Extending to Mexico.

**Tradescantia elongata** Mey. Meseta Central to the Atlantic coast, in moist places. Petals pink. Mexico to South America.

**Tradescantia geniculata** Jacq. Wet places, usually in forest of the tierra caliente. Widely distributed in tropical America. Leaves pilose on the lower surface; flowers white.

### ZEBRINA Schnizl. Wandering Jew

**Zebrina pendula** Schnizl. *Hoja de milagro, Cañutillo.* Common in the Meseta Central, extending to the coasts, in forests or pastures or on open banks. Mexico and Central America. A prostrate plant, the leaves purple beneath, striped longitudinally on the upper surface with silver and green; petals purple. This rather handsome plant is seen commonly in gardens. It is much grown in the United States in houses and hothouses under the name Wandering Jew. In Costa Rica it is often seen in hanging baskets.

## PONTEDERIACEAE. Pickerel-weed Family

### EICHHORNIA Kunth. Water hyacinth

**Eichhornia azurea** (Swartz) Kunth. Abundant in lakes and streams of the tierra caliente, often covering large areas of water. Mexico to South America. Similar to the following species, but the petioles little inflated.

**Eichhornia crassipes** (Mart.) Solms. *Lirio de agua.* Meseta Central to the coasts. South and Central America. A floating aquatic, the petioles inflated and bulb-like, the leaf blade oval; flowers large, delicate, violet, spicate. A beautiful plant, but also a great pest in streams and lakes, where it often completely covers the surface of water. It has become established in large rivers in the state of Florida, where it is so abundant at times as almost to stop navigation. Likewise in the Panama Canal this and the preceding species have to be kept under control. Because of its handsome flowers, the plant is often seen in gardens in the Meseta Central, especially in fountains, and it is grown frequently also in the United States.

### HETERANTHERA Ruiz & Pavón

**Heteranthera limosa** (Swartz) Willd. Swampy places, Meseta Central to the coasts. Widely distributed in tropical America. A succulent plant, the leaves oval or ovate; spathe with a single flower, the delicate perianth blue.

**Heteranthera reniformis** Ruiz & Pavón. Meseta Central to the coasts, common in swampy places, especially along stream

banks. Widely distributed in tropical America. Plants procumbent, the leaves reniform, 2–5 cm. wide; spathe usually 3-flowered; perianth white.

### PONTEDERIA L. Pickerel-weed

**Pontederia rotundifolia** L. Common in the tierra caliente, chiefly near the coasts, floating upon the water or growing in shallow water, often densely covering great areas. Widely dispersed in tropical America. A succulent, glabrous plant as much as 2 meters high, the leaves broadly ovate to lanceolate; flowers in dense spikes, the perianth white. The Central American plant often has been listed as *P. cordata* L., but it now appears that the tropical plant represents a species quite distinct from the one common in the United States.

## JUNCACEAE. Rush Family

In general appearance the plants of this family resemble grasses, but their flowers are altogether distinct, consisting primarily of 6 almost equal, sepal-like segments. The fruit is a small capsule containing few or numerous seeds.

### JUNCUS L. Rush

**Juncus bufonius** L. Common in meadows of the volcanoes, at 1,600–2,600 meters. A plant of wide distribution in temperate and subtropical regions of almost the whole earth. Inasmuch as in Costa Rica it is found only in the high meadows, most of which have been seeded with European grasses, it is probable that the plant is introduced here rather than native. It is a small annual, the other Costa Rican species being perennials.

**Juncus effusus** L. *Junco.* Common through the central region, in moist meadows or in bogs, abundant in some places, especially in the Cantón de Dota, at 1,500–2,200 meters. A species of almost cosmopolitan distribution. Plants as much as a meter high, the stems spongy, terete, the leaves reduced to bladeless sheaths. In Dota and perhaps elsewhere the stems are employed, like the stems of *Eleocharis*, for making the mats used as mattresses.

**Juncus microcephalus** HBK. Central region, wet meadows and stream banks, at 1,300–1,800 meters. Mexico to South America. A tall, slender perennial, the leaves terete and septate.

**Juncus tenuis** Willd. Region of Cartago, and in the meadows of Irazú, 1,300–1,800 meters. Widely distributed in America.

Growing most frequently on banks of small streams. A perennial with narrowly linear, flat leaves.

**Juncus** sp. In the paramos of Cerro de Las Vueltas there grows in abundance a small plant, only 2–5 cm. high, that forms dense and elevated mats. I found it only in a sterile state, and it is impossible to be certain that it is a species of *Juncus;* it may be a species of *Patosia,* a South American genus of the same family. I consider that it is probably a species of *Juncus* related to *J. depauperatus* Phil. of the Andean region.

### LUZULA DC. Wood rush

**Luzula gigantea** Desv. Cerro de Las Vueltas, and probably in other regions of similar elevation (3,000 meters), in paramos or wet forest. Mexico to Peru. A perennial with rather broad (6–11 mm.), flat leaves, much wider than those of the local species of *Juncus.*

## LILIACEAE. Lily Family

### AGAPANTHUS L'Hér.

**Agapanthus umbellatus** L'Hér. *Agapanto, Corona imperial.* An ornamental garden plant, native of South Africa. Large and very showy, with umbels of blue or white flowers.

### ALLIUM L.

**Allium Cepa** L. *Cebolla.* The onion, native of Persia, is one of the most common local vegetables. There are numerous varieties, distinguished by the shape and color of the bulbs.

**Allium sativum** L. *Ajo.* Originally from Europe, garlic is grown and utilized all too commonly, although it is much less favored in Costa Rica than in some other parts of Central America.

### ALOE L.

**Aloe vera** L. *Sávila.* Aloes, a native of the Mediterranean region, is cultivated occasionally, probably for use in domestic medicine. The mucilaginous pulp of the leaves is employed as a purgative. The dried juice of the leaves (acíbar) constitutes the drug aloes, which in small quantities has stomachic properties, and is drastic in large doses.

### ANTHERICUM L.

**Anthericum apodastanthum** Donn. Smith. Rare in fields of the Meseta Central; Cantón de Dota; 1,200–1,800 meters. Ex-

tending to Guatemala. Plants with fleshy-fibrous roots, the leaves basal, linear; flowers yellow, 12–14 mm. long, in racemes.

## ASPARAGUS L.

**Asparagus officinalis** L. *Espárrago.* The common asparagus is grown sometimes as a garden vegetable, the young shoots being the part employed as food. The plant is a native of Europe and Asia.

**Asparagus plumosus** Baker. An ornamental vine of gardens, with very fine, short, slender "leaves." Native of South Africa.

**Asparagus Sprengeri** Regel. *Espárrago.* A large vine, cultivated for ornament. Native of South Africa.

## DRACAENA L.

**Dracaena americana** Donn. Smith. Wet forests of the Atlantic coast, but apparently rare. Extending to British Honduras. A tree as much as 10 meters high, with the aspect of *Yucca;* leaves linear, 20–35 cm. long; flowers small, white, forming large panicles. The plant is of special interest because it is the only American representative (except for another recently described from Guatemala) of a large genus otherwise confined to the Old World, especially Africa. It is a handsome tree, worthy of cultivation as an ornamental in the Meseta Central, where probably it would grow well.

## GLORIOSA L.

**Gloriosa superba** L. Sometimes grown in gardens as an ornamental plant. Native of Africa and Asia. Plants scandent by means of tendril-like prolongations at the tips of the leaves; flowers large and showy, axillary, the segments narrow, crisped, at first yellow, changing to bright red.

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The hyacinth (jacinto; *Hyacinthus orientalis* L.) is sometimes planted in gardens in the tierra templada but, like other bulbous spring flowers of the North (*Tulipa, Narcissus,* etc.), it does not thrive in Central America, even in the coldest regions.

## KNIPHOFIA Moench

**Kniphofia Uvaria** (L.) Hooker. *Molenillo.* Cultivated commonly for ornament and in some places, as at Fraijanes, naturalized in meadows. Native of the Cape of Good Hope. A tall, coarse plant, forming thick clumps, the flowers orange-red, in dense spikes.

### LILIUM L. Lily

**Lilium lingiflorum** Thunb. *Azucena.* A species of Asiatic origin, cultivated commonly in gardens, at least in temperate and cold regions. It is much used in Costa Rica for funeral wreaths.

### NOTHOSCORDUM Kunth

**Nothoscordum bivalve** (L.) Britton. *Cebolilla, Ajillo.* Common in cultivated or waste ground about San José, probably introduced from the north, perhaps from the United States, although it may possibly be native in Costa Rica. A bulbous herb, exactly like some species of *Allium* in appearance, but without an alliaceous odor; flowers white.

### SABADILLA Brandt & Ratz.

**Sabadilla officinalis** (Schlecht. & Cham.) Standl. *Schoenocaulon officinale* Gray. Reported for Costa Rica, but perhaps only in cultivation. Ranging from Mexico to Venezuela. Known in some regions by the name Cebadilla. The seeds contain veratrin. This species and its relatives were employed extensively during the World War for the preparation of an ointment applied to destroy parasites upon the human body.

### SANSEVIERIA Thunb.

**Sansevieria guineensis** (Jacq.) Willd. *Espada de Judas.* Very common in gardens, often planted for low hedges, naturalized in some places. Native of tropical Africa. Leaves erect, rigid, elongate, rising from the ground, sword-shaped, often striped or mottled with pale yellow. They contain a strong fiber utilized in some parts of the earth for cordage. The small and inconspicuous, whitish flowers exhale a strong and pleasant perfume at night.

### SMILACINA Desf.

**Smilacina paniculata** Mart. & Gal. Common in forests of the higher mountains, 1,800–2,400 meters. Mexico to Panama. In Costa Rica the plant is almost always an epiphyte. Plants arising from a rhizome, the stems as much as a meter high, bearing numerous lanceolate or elliptic, nerved leaves; flowers small, white, panicled; fruit a small, red berry.

### TAETSIA Medic.

**Taetsia fruticosa** (L.) Merrill. *Caña de India, Gracena, Cornelina.* An ornamental shrub, common in parks and gardens. Native

of the East Indies. Leaves large, lanceolate, green; flowers very small, in panicles.

**Taetsia fruticosa** var. **ferrea** (Baker) Standl. Cultivated with the typical form; distinguished by the purplish or dark red color of the leaves.

### YUCCA L.

**Yucca elephantipes** Regel. *Itabo.* The only Central American representative of this Mexican group of plants. Abundant throughout the temperate region, and common also near the coasts, especially the Pacific; grown sometimes even in the colder regions. It is not native in Costa Rica but probably was introduced by the Indians before the Spanish conquest, perhaps from Mexico, where it is believed to be native. The long, stiff, dagger-shaped leaves yield a fine, strong fiber that the Indians employed as a textile. Strips split from the leaves are used commonly in place of twine. The large, white, bell-shaped flowers are so much sought as a vegetable that it is rare to find open flowers upon a plant. They are prepared for the table by being fried with eggs, or in other modes. Although slightly bitter, their flavor is quite agreeable. It is believed that the name Itabo is of local Indian origin. In northern Central America the plant is known by the name Izote, a word of Aztec origin.

## SMILACACEAE. Sarsaparilla Family

The family consists of a single genus.

### SMILAX L.

Reference: Killip & Morton, A revision of the Mexican and Central American species of *Smilax*, Carnegie Inst. Wash. Publ. 461: 257. 1936.

Woody vines, usually armed with spines or prickles; leaves alternate, petiolate, palmately nerved, entire or lobate; flowers small, usually greenish, umbellate; fruit a red or black berry with 1–6 seeds.—From the rhizomes of some of the species of the Atlantic coast of Central America is obtained sarsaparilla (zarzaparrilla) of commerce, used in medicine and also for flavoring beverages. Some sarsaparilla is exported from Costa Rica, but it is uncertain from which species it is obtained.

**Smilax angustiflora** A. DC. in DC. Monogr. Phan. 1: 67. 1878; Carnegie Inst. Wash. Publ. 461: *pl. 8.* Alto de La Cruz near Aserrí, *Hoffmann 575.* Collected also at La Palma de San Ramón, 1,200

meters. Stems unarmed, subtomentose; leaves ovate-oblong, cordate at the base, pilose or pilosulous, 7-nerved; staminate umbels long-pedunculate, the flowers 8–9 mm. long. Endemic.

**Smilax Bernhardi** Apt, Repert. Sp. Nov. 18: 418. 1922. A doubtful species, based upon plants cultivated at Berlin, said to have been grown from Costa Rican seeds.

**Smilax candelariae** A. DC. in DC. Monogr. Phan. 1: 70. 1878; Carnegie Inst. Wash. Publ. 461: *pl. 7*. Candelaria, *Hoffmann*. Also at Navarrito, 1,370 meters. Endemic. Leaves ovate to oblong, coriaceous, cordate or subcordate at the base, glabrous above, somewhat pilosulous beneath, 7-nerved; fruiting umbels almost sessile, the pedicels 8 mm. long, the berries bright red.

**Smilax Engleriana** Apt, Repert. Sp. Nov. 18: 407. 1922. Santa Rosa del Copey, 1,100 meters, *Tonduz 11732*. *S. canaliculata* Apt, op. cit. 406 (Las Vueltas, Tucurrique, 700–800 meters, *Tonduz 13303*). Frequent in the central region, 700–1,700 meters. Endemic. Plants glabrous or nearly so, prickly; leaves lanceolate, coriaceous, acute at the base, 5-nerved; peduncles 6 mm. long or less, the pedicels 5–8 mm. long; flowers 6 mm. long; berries red, 6–9 mm. in diameter.

**Smilax Kunthii** Killip & Morton. *Putarrá*. Collected at Agua Caliente, San Isidro de Heredia, and La Palma de San José. Ranging to Ecuador. Plants glabrous or nearly so, sparsely prickly; leaves ovate, rounded or subcordate at the base, 7-nerved; staminate peduncles 3–13 mm. long, the pedicels 5–7 mm. long; flowers 4.5–5 mm. long.

**Smilax lanceolata** L. *Bejuco de canasta*. *S. domingensis* Willd. Escasú, *Standley 32512*. Mexico to Panama. Plants glabrous, sparsely prickly; leaves ovate or ovate-lanceolate, acute at the base, 5-nerved; peduncles 1–7 mm. long, the slender pedicels 4–10 mm. long; flowers 4.5–6.5 long; berries dull red or brown, 5–10 mm. in diameter. The stout, flexible stems of this and other species are sometimes employed in Costa Rica for weaving baskets.

**Smilax mollis** Humb. & Bonpl. Frequent in forests of the central regions, descending to the Atlantic lowlands. Mexico to Panama. Plants unarmed, not conspicuously woody, usually small; leaves ovate-oblong to broadly oval, 7-nerved, glabrate on the upper surface, persistently pilosulous beneath or when young somewhat tomentose; umbels long-pedunculate, the pedicels 3–5 mm.

long; perianth 3–4 mm. long; berries red or yellow, 4–8 mm. in diameter.

**Smilax mollis** var. **hirsutior** Killip & Morton, Carnegie Inst. Wash. Publ. 461: 288. 1936. Río Turrialba, Prov. Cartago, 480 meters, *J. D. Smith 4971*. Endemic. Differs from typical form in having the stems and leaves hirsute with very long, yellowish hairs.

**Smilax panamensis** Morong. *S. ramonensis* Apt, Repert. Sp. Nov. 18: 405. 1922 (San Pedro de San Ramón, 1,400–1,600 meters, *Tonduz 17723*). Widely distributed, chiefly in the tierra caliente at low elevations. Guatemala to Panama. Plants glabrous, sparsely prickly; leaves ovate-oblong or lance-oblong, acute or obtuse at the base, 7-nerved; peduncles 2.5 cm. long or less, the pedicels 5–15 mm. long; perianth 4–6 mm. long; berries large, apparently red.

**Smilax spinosa** Mill. *S. costaricae* Vatke, Linnaea 40: 223. 1876 (San José, *Hoffmann 503, 504*). *S. mexicana* var. *costaricae* A. DC. in DC. Monogr. Phan. 1: 117. 1878. Widely distributed in forest at low and middle elevations; Guanacaste; region of San Ramón. Mexico to Panama. Plants glabrous, sparsely armed or unarmed; leaves ovate to broadly elliptic, acute to rounded at the base, 5-nerved; peduncles 8 mm. long or less, the slender pedicels 5–13 mm. long; perianth 2.8 mm. long or less; berries black, 4–12 mm. in diameter.

**Smilax spissa** Killip & Morton, Carnegie Inst. Wash. Publ. 461: 273. 1936. Between La Muerte and La División, *Pittier 3470*. Also at Térraba, Buenos Aires, and Santo Domingo de Golfo Dulce. Panama. Upper stems unarmed, the plants glabrous; leaves oblong, acute at the base, 5-nerved; peduncles up to 4.5 cm. long; pistillate flowers sessile, 3 mm. long; berries red, 1.5 cm. or less in diameter.

**Smilax Standleyi** Killip & Morton, Carnegie Inst. Wash. Publ. 461: 280. 1936. Los Ayotes, near Tilarán, Guanacaste, 600–700 meters, *Standley & Valerio 45557*. Also at Quebrada Serena in the same region. Endemic. Stems quadrangular, the upper ones unarmed, the plants glabrous; leaves ovate-oblong, obtuse at the base, 5-nerved; peduncles to 2.5 cm. long, the pedicels 9 mm. long or less; perianth 5 mm. long; berries red, 8 mm. in diameter.

**Smilax subpubescens** A. DC. In forest, region of Santa María de Dota and on Volcán Poás, at 2,900 meters or less. Extending to Mexico. Stems unarmed, obtusely quadrangular, tomentose when young; leaves ovate or broadly ovate, truncate to deeply

cordate at the base, tomentose on both sides or later glabrate, 9–11-nerved; peduncles 3.5 cm. long or less, the pedicels to 15 mm. long; perianth 5–6 mm. long; berries orange.

**Smilax vanilliodora** Apt. Repert. Sp. Nov. 18: 416. 1922; Carnegie Inst. Wash. Publ. 461: *pl. 4*. *S. Tonduzii* Apt. op. cit. 414 (Río Ciruelas, *Tonduz 2233*); *S. Gilgiana* Apt. op. cit. 417 (Guácimo, 120 meters, *Tonduz 14639*); *S. barbillana* Cufodontis, Archiv. Bot. 9: 186. 1933 (Río Barbilla, 40 meters, *Cufodontis 658*). Hacienda El Guayabo, near Turrialba, 600–700 meters, *Gómez*. In forest, widely distributed, at 1,900 meters or less. Endemic. Plants glabrous, armed with stout prickles; leaves oblong-lanceolate to ovate, broadly cuneate to subcordate at the base, 5–9-nerved; pistillate peduncles usually longer than the petioles, the pedicels to 17 mm. long; berries red, 1 cm. or more in diameter.

## HAEMODORACEAE. Bloodwort Family

### XIPHIDIUM Aubl.

**Xiphidium caeruleum** Aubl. *Durandia macrophylla* Boeckl. Allg. Bot. Zeitschr. 2: 173. 1896. Common in wet forests of the Atlantic coast, also on the Pacific slope. Widely distributed in tropical America. A perennial herb, in foliage much like an *Iris*, the leaves sword-shaped and equitant; flowers small, white, in terminal panicles; fruit a fleshy, red capsule. The genus *Durandia*, based upon Costa Rican material, was referred by its author, strangely enough, to the Cyperaceae, a group with which it certainly has little in common. The plant is a characteristic forest species of the tierra caliente of Central America.

## AMARYLLIDACEAE. Amaryllis Family

Reference: J. G. Baker, Handbook of the Amaryllideae. 1888.

Perennial plants of various habit, acaulescent except in *Bomarea;* flowers usually large and showy; fruit a capsule.

### AGAVE L.

**Agave Wercklei** Weber ex Trelease, Contr. U. S. Nat. Herb. 23: 132. 1920. Based upon plants collected by C. Wercklé, and cultivated in San José in the garden of Doña Amparo Zeledón. Endemic. I do not know in what part of Costa Rica this handsome plant, with large, thick, spiny leaves, is native.

The genus Agave has its center of distribution in Mexico, where there are about 170 species. There are not many native species in

Central America, but a few do exist in Guatemala and Salvador. In Mexico they are plants of the greatest economic importance, supplying useful fibers and the famous beverages known as pulque, mescal, and tequila. Some exotic species are planted in Costa Rican gardens as ornamental plants.

## BOMAREA Mirb.

Climbing herbs, the roots tuber-bearing, the stems with numerous alternate, lanceolate or ovate leaves; flowers red, bell-shaped, in simple or compound umbels; seeds with a fleshy, red testa.—Among the many lovely flowers of Costa Rican forests there are few more beautiful than the Bomareas, which are conspicuous almost everywhere in the higher mountains.

**Bomarea acutifolia** (Link & Otto) Herb. *Papa de venado.* Common in forests of higher mountains, at 2,000–3,000 meters. The root tubers are edible, as in other species, but have little flavor.

**Bomarea chontalensis** Seem. Wet forests of the mountains. Also in Nicaragua.

**Bomarea costaricensis** Kränzlin, Bot. Jahrb. 50, Beibl. 112: 4. 1913. Cerro de Buena Vista, *Pittier 10457.* Also on slopes of Irazú and Poás, 2,000–2,800 meters. Endemic. Flowers exceptionally large, 5 cm. long.

**Bomarea edulis** (Tuss.) Herb. *Papa de venado.* Common at the edge of forest, in the higher mountains, 1,400–3,000 meters.

**Bomarea Porschiana** Cufodontis, Archivio Bot. 9: 11. 1933. Volcán de Turrialba, 2,500 meters, *Porsch 753.* Endemic.

## CRINUM L.

**Crinum cruentum** Ker. Wet soil at low elevations; also in cultivation. Plants with large bulbs, the leaves strap-shaped, 4–7 cm. wide; flowers 10–20 cm. long, in umbels, pink or white.

**Crinum erubescens** Soland. An ornamental plant of gardens, perhaps naturalized in some localities. Of American origin. Flowers white, tinged outside with pink, their segments linear-lanceolate, as much as 25 cm. long.

**Crinum longiflorum** Herb. Common in gardens, and perhaps naturalized in some localities. Of American origin. A very large and coarse plant, the bulbs 10 cm. or more in diameter; leaves 4–10 cm. wide; flowers pedicellate, 20 cm. long, pink.

### CURCULIGO Gaertn.

**Curculigo scorzonerifolia** (Lam.) Baker. Grassy places of slight elevation; probably on the Pacific slope. Widely distributed in tropical America. Leaves linear, 5–20 mm. wide; flowers yellow, arising from the axils of the leaves.

### EUCHARIS Planch.

**Eucharis grandiflora** Planch. *Eucaristo, Eucaristia.* An ornamental plant of gardens. Native of Colombia. Plants acaulescent, arising from a bulb, the leaves broad, distinctly petiolate; flowers umbellate, white, fragrant, 7 cm. long, with a very slender tube.

**Eucharis himeroessa** Sandwith, ined. A plant collected at El Rodeo by C. H. Lankester, and cultivated in the Kew Gardens, London. No description has been published of this species, the only one known to be native north of Colombia. The flowers are smaller than in the preceding species.

### FURCRAEA Vent.

**Furcraea Cabuya** Trelease, Ann. Jard. Bot. Buitenzorg II. Suppl. 3: 906. 1910. *Cabuya, Cabuya con espinas.* Type collected at San Ramón. Common in dry places, especially at 1,000–2,000 meters; cultivated in many localities, particularly around Cartago. Also in Panama. The fine, strong fiber is much used for making rope and other articles. The following Indian names are reported for the species: Bis (Cabécara); Amú (Bribrí); Kik (Térraba).

**Furcraea Cabuya** var. **integra** Trelease, op. cit. 907. 1910. *Cabuya, Cabuya sin espina, Cabuya de Olancho, Cabuya blanca.* Cultivated and perhaps also native. Honduras to Panama. In the species the long leaves are armed on their margins with stout spines; the leaves of the variety are spineless.

### HIPPEASTRUM Herb.

**Hippeastrum puniceum** (Lam.) Urban. *Nardo. H. reginae* Herb. A common plant in gardens, native of South America. Flowers very large and showy, bright red. Commonly this plant is confused with the genus *Amaryllis*, a quite distinct group.

### HYMENOCALLIS Salisb.

**Hymenocallis littoralis** (Jacq.) Salisb. Common in wet or swampy places of the tierra caliente, usually on or near sea beaches. Widely distributed in tropical America. Plants with large bulbs, the strap-shaped leaves 4–8 cm. wide; scape very thick, 60 cm.

high, the flowers capitate, white, 15–20 cm. long, fragrant; stamens united by a membrane that forms a corona. Through some slip of the pen this plant has been listed by the writer in the *Flora of the Panama Canal Zone* and elsewhere under a fictitious name, "*H. americana* (L.) Salisb."

## HYPOXIS L.

**Hypoxis decumbens** L. *Trompa de chancho.* Common in grassy places of the Meseta Central and probably in savannas at lower elevations. Widely distributed in tropical America. A low, acaulescent plant, the leaves linear, pilose; flowers small, yellow, 3–4 at the apex of a short, slender scape.

**Hypoxis decumbens** var. **major** Seub. Las Cóncavas, Prov. Cartago, 1,200 meters. Plants as much as 40 cm. high, the scape with 4–8 flowers. Probably nothing more than an exuberant state, resulting from an unusual abundance of water.

## PHAEDRANASSA Herb.

**Phaedranassa Carmioli** Baker in Saund. Refug. Bot. *pl. 46.* 1869; Bot. Mag. *pl. 8356.* Based upon plants cultivated in England by Wilson Saunders in 1867, sent from Costa Rica by Julio Carmiol. In 1925 I found the plant flowering in a garden at Santa María de Dota. Although described from Costa Rica, and known to grow there in gardens, it probably is not native, and it has been reported recently from Peru. The other species of the genus are all natives of the Andean region. A very pretty, bulbous plant with lanceolate, petiolate leaves; flowers umbellate, tubular, pale red, the tips of the segments green. As indicated above, there has been published a colored plate of this plant, which well deserves introduction to foreign gardens.

## POLIANTHES L. Tuberose

**Polianthes tuberosa** L. *Nardo.* The tuberose is cultivated commonly in gardens for its very fragrant, white flowers. Native of Mexico, where probably it has been in cultivation for a good many centuries. The garden plant usually has double flowers.

## SPREKELIA Heist.

**Sprekelia formosissima** (L.) Herb. Cultivated frequently in the Meseta Central as an ornamental garden plant. Native of Mexico and Guatemala. Somewhat similar in appearance to *Hippeastrum,* but the flowers solitary rather than umbellate, bright red, with narrow segments.

### ZEPHYRANTHES Herb.

**Zephyranthes carinata** (Spreng.) Herb. *Lágrimas de María. Atamosco carinata* Standl. Common in gardens; naturalized in grassy places of the Meseta Central and doubtless other regions. Native of Mexico, Central America, and the West Indies. A bulbous plant with linear leaves; scape bearing a single pink flower 5–7 cm. long.

## DIOSCOREACEAE. Yam Family

Reference: R. Knuth, Dioscoreaceae, Pflanzenreich IV. 43. 1924.

Represented in Central America by a single genus.

### DIOSCOREA L. Yam

Climbing herbs, with rhizomes, these sometimes tuberous and very large; leaves petiolate, broad, palmately nerved; flowers minute, white, green, or purple, with 6 stamens some of which may be sterile; fruit a 3-angled, 3-celled capsule; seeds winged.

**Dioscorea alata** L. *Name común, Name blanco.* Cultivated from the coasts up to an elevation of about 1,200 meters. The most common yam of Costa Rica, probably of Asiatic origin. The species may be recognized easily by the narrow wings of the stems, the stems of the other species lacking such wings. Pittier states that if one may judge by the scant variation exhibited by this plant, its cultivation in Costa Rica is not ancient.

**Dioscorea borealis** Morton, Journ. Wash. Acad. Sci. 27: 304. 1937. El General, 880 meters, *Skutch 2638.* Leaves broadly ovate, the larger 11 cm. long and 10 cm. wide, acuminate, shallowly cordate at the base, glabrous, 9–11-nerved; flowers racemose, on pedicels 1–1.5 mm. long; stamens 6.

**Dioscorea bulbifera** L. *Papa caribe, Papa del aire, Papa voladora.* Cultivated and in some places naturalized. Native of Asia. Pittier states that it is grown only in Nicoya, but it may be seen in various parts of the Atlantic coast of Central America. It produces in the leaf axils enormous bulblets or tubers, edible, as is the root, if certain precautions are taken in cooking them.

**Dioscorea cayennensis** Lam. *Name negro.* Cultivated on the Atlantic coast, chiefly by the West Indian negroes. A yam of inferior quality.

**Dioscorea convolvulacea** Cham. & Schlecht. *D. esurientium* Uline. Meseta Central to the Pacific coast, and probably on the

Atlantic slope. Leaves broadly cordate-oval, 7–9-nerved; capsules 12–14 mm. long. The rhizomes of the species native in Central America are not edible, and they may, indeed, be poisonous, since it is well known that species of other regions have poisonous properties. In some parts of the world they are employed as barbascos, i.e., for intoxicating fish. Some Costa Rican material placed here is referred by Morton to *D. convolvulacea* var. *glabra* (Hemsl.) Uline.

**Dioscorea costaricensis** Knuth, Pflanzenreich IV. 43: 65. 1924. Nicoya, *Tonduz 13724*. Region of San Ramón. Also in Mexico. Leaves oblong-deltoid, 7-nerved; stamens 6; capsules oblong, 2 cm. long.

**Dioscorea cyanisticta** Donn. Smith, Bot. Gaz. 20: 10. 1895. Stony places, Río Turrialba, 530 meters, *J. D. Smith 4969*. A glabrous plant with cordate, 11-nerved leaves; fertile stamens 3.

**Dioscorea joseensis** Knuth, Pflanzenreich IV. 43: 159. 1924. San José, *Brade 2049*. Region of San Ramón, and El Naranjo. Endemic. Leaves ovate-cordate, 9-nerved, pubescent beneath; capsules 2 cm. long.

**Dioscorea laevis** Uline, Bot. Jahrb. 22: 425. 1897. San José, *Hoffmann 199*. Region of San Ramón. Endemic. Plants glabrous, the leaves cordate, 9-nerved; stamens 3.

**Dioscorea lepida** Morton, Carnegie Inst. Wash. Publ. 461: 248. 1936. Laguna de La Chonta, northeast of Santa María de Dota, Prov. San José, 2,000 meters, *Standley 42133*. Region of Santa María, at 2,000–2,400 meters. Also in Panama. Leaves ovate, cordate at base, 9-nerved; capsule narrowly oblong, 10–16 mm. long.

**Dioscorea macrostachya** Benth. Meseta Central to the coasts, at 1,500 meters or less. Plants glabrous, the leaves ovate-cordate, 7–9-nerved; fertile stamens 6; capsule oblong, 2 cm. long.

**Dioscorea matagalpensis** Uline. Mountains of Guanacaste, 600 meters. Extending to Yucatan. Leaves glabrous, cordate, 7-nerved; stamens 6.

**Dioscorea racemosa** (Klotzsch) Uline, var. **Hoffmannii** Uline, Bot. Jahrb. 22: 431. 1897. Candelaria, *Hoffmann 614*. Region of San Ramón at 1,000–1,100 meters. Plants glabrous, the leaves 11–13-nerved; stamens 3.

**Dioscorea remota** Morton, Journ. Wash. Acad. Sci. 27: 304. 1937. El General, 975 meters, *Skutch 2197*. Referable to the section

*Cryptantha*, a Brazilian group. Leaves broadly ovate, 15 cm. long, 10 cm. wide, acuminate, cordate at the base, 7–9-nerved, glabrous; staminate inflorescences up to 90 cm. in length, the flowers solitary, remote, sessile.

**Dioscorea sapindoides** Presl. Forests of the coasts, at 200 meters or less. Leaves glabrous, cordate-oblong, 7-nerved; flowers pubescent; capsule 13 mm. long. Also in Panama.

**Dioscorea Standleyi** Morton, Carnegie Inst. Wash. Publ. 461: 252. 1936. Wet forest, La Hondura, Prov. San José, 1,200–1,500 meters, *Standley & Valerio 51877*. Collected also at Yerba Buena and La Palma de San José. Endemic. Leaves ovate, cordate at the base, 9-nerved; stamens 3, the filaments long-connate.

**Dioscorea trifida** L. *Name de la India.* A species perhaps of American origin, cultivated for its tubers, which, although small, are of excellent quality. The species may be recognized by its 5-lobate leaves. Among the West Indians of the Atlantic coast the plant is known by the name Yampí.

Among Indian names reported from Costa Rica for yams (probably *Dioscorea alata*) are the following: Serí-de-uá (Cabécara); Tu (Bribrí); Du (Brunka); Túe (Guatuso); Tselido (Talamanca).

## IRIDACEAE. Iris Family

Reference: J. G. Baker, Handbook of the Irideae. London, 1892.

Perennial herbs with narrow, equitant leaves disposed in two ranks; flowers enclosed in a spathe composed of bracts, usually showy; fruit a 3-celled capsule.

### CIPURA Aubl.

**Cipura paludosa** Aubl. Guanacaste, in wet fields; probably also in other regions. Widely distributed in tropical America. Flowers large and white, the perianth segments very delicate and soon withering.

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In gardens are grown commonly various forms of the genus *Gladiolus*, notable for their large and brilliantly colored flowers. They are plants of African origin.

### MARICA Ker

**Marica caerulea** Ker. A Brazilian species, grown in gardens of San José. Recognizable by its winged scapes and large, blue flowers.

**Marica gracilis** Herb. Wet forests of Guanacaste, and in other parts of the tierra caliente, at 300–700 meters; region of San Ramón, at 1,125 meters. A species of wide distribution in tropical America. Plants about 60 cm. high, the scapes broadly winged; leaves linear, 1.5–2.5 cm. wide; flowers large, white; seeds with a bright red aril.

## MORAEA Mill.

**Moraea iridioides** L. Sometimes planted for ornament about San José. Native of Africa. A handsome, iris-like plant, the stems with many closely appressed, sheathing bracts; flowers white, marked with yellow, as much as 8 cm. broad.

## NEMASTYLIS Nutt.

**Nemastylis triflora** Herb. One Costa Rican collection is perhaps referable to this Guatemalan species. It is a bulbous plant with plicate leaves, the rather large flowers violet-blue.

## ORTHROSANTHUS Sweet

**Orthrosanthus chimboracensis** (HBK.) Baker. Common in meadows of the higher mountains; Piedra Blanca; Cantón de Dota; 1,400–3,000 meters. A very showy plant similar to an *Iris*, the scapes as much as a meter high; leaves pale green, 1 cm. wide; flowers large, blue. A characteristic species of paramos and mountain meadows, sometimes forming dense colonies of wide extent. Mexico to the Andes.

## SISYRINCHIUM L.

A group of American plants, widely dispersed in temperate or subtropical regions; leaves narrow and grass-like; flowers usually small, blue or yellow.

**Sisyrinchium alatum** Hook. Las Cóncavas, in pastures, 1,200 meters. Flowers yellow; scapes branched. The plants blacken in drying, and impart a purple color to the papers between which they have been dried. Mexico to South America.

**Sisyrinchium iridifolium** HBK. Meadows of Volcán de Turrialba, 2,000–2,400 meters. A South American species extending to Guatemala. Flowers yellow; stems little branched; capsules 1–2 cm. long.

**Sisyrinchium micranthum** Cav. Abundant throughout the central region, at 800–1,800 meters, growing in pastures, meadows, and cultivated ground, often in coffee plantations. Plants small

and delicate, the leaves narrow; flowers pink or pale blue; capsules only 3 mm. long. Mexico to South America.

**Sisyrinchium tinctorium** HBK. Common throughout the central region, at 1,200–2,600 meters, growing in meadows or other grassy places. Flowers large, yellow; scapes not branched, terminated by a single spathe. Southern Mexico to South America.

### TIGRIDIA Juss.

**Tigridia Pavonia** (L. f.) Ker. *Guatemala.* An ornamental plant with very large, red, showy flowers, often cultivated in gardens. Native of Mexico and Guatemala. It is said that it has become naturalized in cornfields of the Volcán de Barba, also in fields at San Pedro de San Ramón, 1,000 meters.

### TRITONIA Ker

**Tritonia crocosmaeflora** Lem. *Chispa.* Cultivated for ornament in gardens. A tall plant with linear leaves; flowers 4 cm. long, orange-yellow. It is stated that this well-known garden plant is a hybrid between *T. Pottsii* Benth. and *Crocosmia aurea* Planch.

### WATSONIA Mill.

**Watsonia angusta** Ker. Found by Mr. C. H. Lankester and the writer growing beside a small dwelling at Alto de La Estrella, south of Cartago. There were several large clumps of the plant with its showy, pale red flowers. It is a species of South African origin that I have never seen elsewhere in Central America, nor had Mr. Lankester found it in any other place in Costa Rica. It would be interesting to know how the plant reached this remote spot.

## MUSACEAE. Banana Family

### HELICONIA L.

Reference: R. F. Griggs, Some new species and varieties of *Bihai*, Bull. Torrey Club 42: 315–330. 1915.

Tall or medium-sized herbs, the larger ones resembling species of *Musa*, the smaller ones canna-like in habit; stems simple, the broad leaves 2-ranked; flowers arranged in a terminal spike, this provided with large, 2-ranked bracts of various colors; fruit a small, fleshy capsule.—This is the only genus of the family native in Central America.

**Heliconia acuminata** L. Rich. *Platanillo. Bihai acuminata* Kuntze. Abundant in wet forests of the Atlantic slope, ascending

to Pejivalle (900 meters); also on the Pacific coast; region of San Ramón, at 1,100 meters. Widely distributed in Central America. Plants 1.5–2 meters high; leaves 10 cm. wide or narrower; inflorescence erect, the bracts remote, narrow, red; flowers yellow; fruits purple. A very handsome plant, like all other species of the genus. The Heliconias form a conspicuous element in almost all forests of the tierra caliente and supply a large part of the color seen in those regions, where there are but few bright-colored flowers. The bracts often are full of water in which mosquitoes and other insects breed.

**Heliconia aurantiaca** Ghiesbreght. *Caliguate* (Pittier). Forests of the Atlantic coast, and in Guanacaste. Ranging to Mexico. Plants 1–1.5 meters high, slender, the leaves relatively narrow; inflorescence erect, the bracts remote, colored with orange and bright green; flowers yellowish white.

**Heliconia Bihai** L. *Platanillo.* Forests of the Atlantic coast. Plants medium-sized, with large leaves; inflorescence erect, the bracts broad, appressed, colored with yellow, red, and bright green; fruits pale yellow, blue when fully ripe. Perhaps the handsomest of all Central American species because of the vivid and handsome coloring of its inflorescence. For this species there are reported the following indigenous names: Karsik (Bribrí); Krangká (Brunka); Krogá (Térraba); Pukuri tsa-ora (Guatuso). Mexico and West Indies to northern South America.

**Heliconia curtispatha** Petersen. Swampy forests of the Atlantic coast. Nicaragua to Panama. A large plant, 3–4 meters high; inflorescence pendent, as much as 60 cm. long, 7–8 cm. wide, the bracts appressed, short and very broad, dark red. A showy plant, forming large clumps or small colonies. Nicaragua to Panama.

**Heliconia elongata** Griggs. Reported from the Atlantic coast. Plants 3 meters high, the leaves large; inflorescence erect, the bracts widely spaced, broad, red and green. Ranging to Guatemala.

**Heliconia imbricata** (Kuntze) Baker, Ann. Bot. 7: 191. 1893. *Bihai imbricata* Kuntze, Rev. Gen. 684. 1891. Atlantic coast. Also in Panama. Plants 3–4 meters high, with very large leaves; inflorescence erect, the bracts imbricate, red, as much as 10 cm. long; fruits blue. The Bribrí name is reported as Po.

**Heliconia Lankesteri** Standl. Journ. Wash. Acad. Sci. 17: 162. 1927. Wet forest, La Estrella, Prov. Cartago, *Standley 39494.* Regions of Orosi and El Copey, 1,800 meters. Endemic. Plants

1.5–2.5 meters high; inflorescence erect, the bracts separated, red or dark yellow.

**Heliconia latispatha** Benth. Forests of the Atlantic slope and mountains of Guanacaste, ascending to 1,600 meters; region of San Ramón. Plants 1.5–2.5 meters high, with large leaves; inflorescence erect, the bracts separated, red, red and yellow, or yellow and green, narrow. Central America and northern South America.

**Heliconia Mariae** Hook. f. Wet or swampy places of the Atlantic coast. Generally distributed along the Atlantic coast of Central America. The tallest plant of the genus, as much as 6 meters high, the leaves 2–3 meters long; inflorescence pendent, 40 cm. long and 10 cm. wide, or often much larger, very thick, dark red, the bracts short, broad, closely imbricate, hairy, numerous; flowers pink or white; fruits dark blue. The plants are almost as large as banana plants, which they much resemble. In some parts of the coast they form dense thickets that are almost or quite impenetrable, for the heavy and solid trunks often grow close together. In the Canal Zone this species has been given the name of Beefsteak Heliconia because of the resemblance of the inflorescence in shape and color to a large piece of raw beefsteak.

**Heliconia osaensis** Cufodontis, Archivio Bot. 9: 13. 1933. Península de Osa, Golfo Dulce, forests of Río Nuevo near Puerto Jiménez, *Cufodontis 158*. Endemic. Plants 1.5 meters high, the bracts red.

**Heliconia platystachys** Baker. On shores, Golfito de Osa, *Brenes 12325*. Guatemala to Colombia. A huge plant, 4–5 meters high with very large, green leaves; inflorescence as much as 1.5–2 meters long, heavy, pendent, dark red, the bracts broad, long-acuminate, distantly spaced, the rachis very tortuous; fruits blue.

**Heliconia pogonantha** Cufodontis, Archivio Bot. 9: 15. 1933. Between La Castilla and Los Negritos, 12 km. from the mouth of Rio Reventazón, *Cufodontis 621*. Endemic. Plants as much as 6 meters high, the pendent inflorescence up to 2 meters in length.

**Heliconia reticulata** (Griggs) Winkler in E. & P. Nat. Pfl. ed. 2. 15a: 536. 1930. *Bihai reticulata* Griggs, Bull. Torrey Club 31: 446. 1904. In a quebrada near Buena Vista, *Cook & Collins 149*. Endemic. Leaves large, the veins red on the lower leaf surface; inflorescence erect, arising near the base of the plant, the bracts appressed, glabrous, probably red; flowers red and yellow.

**Heliconia tortuosa** Griggs. *Platanillo.* Common in the central region, 1,100–1,500 meters. Guatemala to Panama. Plants 1.5–3 meters high, with large leaves; inflorescence erect, the bracts narrow, red, more or less pilose. The broad leaves of this and other species are employed, like those of the banana, for wrapping small articles for market and elsewhere.

## MUSA L.

**Musa paradisiaca** L. *Plátano.* Originally from the tropics of the Old World, the plantain was introduced by the Spaniards, probably immediately after the conquest, and now it is grown everywhere except in the coldest parts of the country. The plantain is less rich in sugar than the banana, and larger, and is to be considered rather a vegetable than a fruit, in the popular sense of the word. It is certainly one of the best of all tropical vegetables, and it is to be regretted that it is not available in the markets of the United States in the same abundance as the banana. As a rule, plantains are not procurable in the cities of the United States, except sometimes in the most expensive shops dealing in imported articles, but during the past year or two they have been obtainable freely in Chicago, in a single place where Costa Ricans offer them for sale! Among Indian names cited for the plant are: Corub (Bribrí); Crub (Cabécara); Ibing (Térraba); Zanga, Zuli (Guatuso).

**Musa sapientium** L. *Guineo, Banano.* This plant, after maize and beans, is in its numerous varieties perhaps the most important food plant of Costa Rica. It was introduced by the Spaniards immediately after the conquest. It is of Asiatic origin, and there is no true basis for reports that it existed in America before the arrival of Europeans. With regard to the banana, Pittier says: "The banana is *par excellence* the tropical fruit that may be eaten either raw or prepared in a thousand different ways. Its cultivation for export began in Costa Rica about 1879, and it is probable that the Costa Rican variety *patriota* is nothing more than the Martinican Gros Michel, and of introduction contemporaneous with the establishment of the banana industry on the Atlantic coast. The export of this fruit, begun February 7, 1880, the day that the Norwegian steamship *Earnholm* sailed from Limón with 360 stems of bananas for New York, has had a fantastic growth, and has contributed greatly to the prosperity and development of Costa Rica. In 1907 the quantity exported amounted to 9,000,000 stems." The bananas grown for export have been produced on the plains of the Atlantic

coast. The industry has declined greatly in recent years for various reasons, the principal one being the unfortunate spread of the banana disease, which has done so much damage to plantations in many parts of tropical America. Besides the common banana that is imported in such huge quantities into the United States, and may be obtained throughout the year in the most obscure settlements of the country, being, indeed, probably the favorite fruit of the whole United States, there are grown in Costa Rica numerous varieties unknown outside the tropics. The *guineo morado* or red banana does reach the United States at times, but nothing is known there of the most popular varieties of Central America that are eaten only when cooked, and supply a delicious vegetable. The following Indian names have been reported from Costa Rica: Chimú (Bribrí); Chemó (Cabécara); Chimó (Chirripó); Ving siguah (Térraba); Kei-bing (Tiribí); Bin-sigua (Térraba).

**Musa Cavendishii** Lamb. *Banano enano, Guineo de jardín.* This species, of Chinese origin, is cultivated sometimes in the fincas of the Atlantic coast as an ornamental or as a curiosity. It is a low plant, only 1.5–3 meters high. Because it is rich in tannin, the fruit, even when fully ripe, has a somewhat bitter flavor.

**Musa Ensete** Gmel. *Banano coyolillo.* This species also, of African origin, is seen sometimes in fincas of the Atlantic coast. The fruit is noteworthy because it contains a considerable number of large and extremely hard seeds.

**Musa textilis** Née. *Abacá.* A Philippine plant of recent introduction. In appearance much like the plantain. It supplies the fiber known as Manila hemp (cáñamo de Manila). It grows well in the Atlantic region, and even about San José, having given good results in the Campo Nacional de Agricultura.

### RAVENALA Adans.

**Ravenala madagascariensis** Sonnerat. *Arbol del viajero. Traveler's tree.* Native of Madagascar, a highly ornamental plant, characterized by its distichous foliage, suggestive of a great fan. The bases of the leaves hold rain water, whence the common name. Unlike the banana, the *Ravenala* has a true trunk, the apparent trunk of the banana plant being composed of tightly rolled leaf petioles. The plant is beginning to be planted in Costa Rica, and a handsome specimen occurs in front of the Ministerio de Relaciones Exteriores (San José).

## ZINGIBERACEAE. Ginger Family

Reference: K. Schumann, Pflanzenreich IV. 46. 1902.

### COSTUS L.

Large herbs, the long stems composed of the spirally twisted leaf sheaths, the leaf blades lanceolate or obovate, thick; flowers arranged in a dense, cone-like, globose or elongate spike.

**Costus bracteatus** Rowlee, Bull. Torrey Club 49: 285. *pl. 12.* 1922. Forests of Siquirres, *Stork, Rowlee & Stork 675.* The author of the species states that he found a single clump of the plants. Endemic. Stems 2 meters high; flower spike terminating a short scape that arises directly from the rhizome. In other species listed here the spike terminates the stem bearing the leaves.

**Costus formosus** Morton, Journ. Wash. Acad. Sci. 27: 305. 1937. Near El General, 850 meters, *Skutch 2775.* Plants 3.5 meters high; leaves oblanceolate or oblong, about 23 cm. long and 7 cm. wide or larger, glabrous above, puberulent beneath; spike cylindric, 19 cm. long and 4 cm. thick, the bracts broadly ovate, obtuse, closely imbricate, red.

**Costus hirsutus** Presl. Common in the region of the Meseta Central, ascending the slopes of the volcanoes to 1,500 meters; San Ramón; Cantón de Dota; wet forests of the Atlantic slope. Plants 1–2 meters high, covered in almost all parts with long, soft hairs; bracts red, tipped with a leafy appendage. Southern Mexico and Central America.

**Costus laxus** Peters. in Mart. Fl. Bras. 3, pt. 3: 56. 1890. Type collected by Oersted, without indication of the exact locality. Endemic. Plants 2 meters high; leaves glabrous; spike 13 cm. long; corolla yellow. It is possible that this species is not distinct from *C. cylindricus* Jacq., of the Antilles.

**Costus Lima** Schum. Pflanzenreich IV. 46: 388. 1902. Puntarenas, *Scherzer.* Wet forests of the coasts. Plants 2–6 meters tall, the leaves finely pubescent; flower spikes 20 cm. long, the bracts with a leafy appendage, red. Endemic.

**Costus Malortieanus** Wendl. Hamb. Gartenzeit. 19: 30. 1863; Bot. Mag. *pl. 5895.* Forests of Río Sarapiquí, *Wendland.* Atlantic coast. Endemic. Plants 50 cm. high, densely hairy; leaves obovate, 35 cm. long; flower spike 5 cm. long, the bracts not appendaged;

corolla yellow. The plant has been cultivated in hothouses of Europe and the United States.

**Costus nutans** Schum. Pflanzenreich IV. 46: 407. 1902. Aguacate, *Hoffmann 727*. Also in Panama. Stems slender, 75 cm. high; leaves more or less hirsute; flower spike 4 cm. long, the bracts not appendaged.

**Costus podocephalus** Donn. Smith, Bot. Gaz. 23: 250. 1897. Guápiles, 280 meters, *J. D. Smith 4972*. Also in forests of Talamanca. Endemic. I have seen no material of this species.

**Costus sanguineus** Donn. Smith, Bot. Gaz. 31: 122. 1901. Abundant in wet forest of the Atlantic coast, ascending to La Palma, at 1,450 meters or less; San Ramón; Guanacaste. Stems 1–1.5 meters high; leaves hort-hirsute; spikes narrow and elongate, as much as 13 cm. long, red, the bracts not appendaged. Panama to Guatemala.

**Costus Skutchii** Morton, Journ. Wash. Acad. Sci. 27: 306. 1937. El General, 850 meters, *Skutch 2690*. Leaves distinctly petiolate, oblong-oblanceolate, 25 cm. long and 7 cm. wide, acuminate, glabrous or nearly so; spike ellipsoid, obtuse, 9 cm. long, 3.5 cm. thick, the bracts red, densely imbricate, coriaceous, rounded at the apex; corolla red-purple.

**Costus spicatus** (Jacq.) Swartz. *Cañagria*. Wet forests of the coasts, and in Guanacaste; San Ramón. Stems 1–2 meters high; leaves glabrous; flower spikes oblong, 7 cm. long, red, the bracts not appendaged; corolla orange-red. In Costa Rica the name Cañagria is given to this and other species of the genus. The acid sap obtained from all parts by infusion or maceration is employed commonly in domestic medicine, especially as a diuretic. Southern Mexico to West Indies and northern South America.

**Costus splendens** Donn. Smith & Tuerckh. *C. giganteus* Kuntze, Rev. Gen. 687. 1891, non Ridley, 1887. *C. maximus* Schum. Pflanzenreich IV. 46: 405. 1902. Wet forests of the Atlantic coast; region of San Ramón. Guatemala to Panama. Stems as much as 5 meters high and 4 cm. thick; leaves glabrous; flower spikes large, green and red, the basal bracts appendaged.

**Costus villosissimus** Jacq. Wet forest of the Atlantic coast, sometimes growing in swamps or on stream banks. Plants 1–2.5 meters tall, covered everywhere with long, yellow hairs; spikes

elongate, the bracts appendaged. Central America and northern South America.

### CURCUMA L.

**Curcuma longa** L. *Camotillo, Yuquilla.* A native of India, sometimes cultivated in Costa Rica. In the East Indies the plant is a source of a condiment and a dye.

### DIMEROCOSTUS Kuntze

**Dimerocostus uniflorus** (Poepp.) Schum. Talamanca, and probably in other regions. Abundant in Panama and extending to Peru; growing in shallow water. Plants with the appearance of *Costus*, the thick stems 3–4 meters high, the leaves all on the upper part of the stem, 20–40 cm. long; flower spike 20–25 cm. long; flowers white, 7 cm. long, very showy, opening one at a time.

### HEDYCHIUM Koenig

**Hedychium coronarium** Koenig. Cultivated for ornament in gardens, and completely naturalized in boggy places, as at Santa María de Dota. Native of India. Plants a meter high, with leafy stems; flowers very large, white, fragrant.

### LANGUAS Koenig

**Languas speciosa** (Wendl.) Merrill. *Perlas de oriente, Collar de la reina, Lirio de Colón, Grano de oro, Lágrima de San Juan, Lágrima de Nazareno. Alpinia speciosa* Schum. Native of eastern Asia. Plants 1–2 meters high, forming thick clumps, densely leafy; flowers large and exceedingly showy, the bracts pink and white, the lip of the corolla yellow spotted with dark red.

### RENEALMIA L. f.

**Renealmia aromatica** (Aubl.) Griseb. *R. occidentalis* Sweet. Wet forests of the Atlantic coast; San Ramón, 1,075 meters. A species of wide distribution. Stems 1–2 meters high, the leaves lanceolate; flower spike terminating a short, bracted scape rising directly from the rhizome; corolla yellow; capsule scarlet.

**Renealmia cernua** (Sw.) Macbride. *R. strobilifera* Poepp. & Endl. Common in forests of the Atlantic slope, ascending to Dulce Nombre; region of San Ramón; at 1,300 meters or less. Ranging to Peru. Stems 1–1.5 meters high, very leafy; flower spike cone-like, orange, terminating the stem. In the other species listed here the inflorescences arise from the base of the plant.

**Renealmia concinna** Standl. Journ. Wash. Acad. Sci. 17: 249. 1927. Wet forest, Guápiles, 300 meters, *Standley 37355*. Endemic. Plants 1.5 meters high.

**Renealmia costaricensis** Standl., nom. nov. *R. densiflora* Standl. Journ. Wash. Acad. Sci. 17: 249. 1927, non Urban, 1921. Wet forest, Finca La Colombiana, Prov. Limón, 70 meters, *Standley 36944*. Also in Panama. Stems 1.5–2.5 meters high.

**Renealmia erythrocarpa** Standl. Journ. Wash. Acad. Sci. 17: 248. 1927. Wet forest, Naranjos Agrios, near Tilarán, Guanacaste, 700 meters, *Standley & Valerio 46373*. Endemic. Plants 60–120 cm. high; fruits red.

**Renealmia exaltata** L. f. Wet forests of the Atlantic coast, perhaps also of the Pacific. A species of wide distribution. Plants very large, sometimes as much as 4 meters high; leaves 30–100 cm. long; corolla pink; capsule 2 cm. thick.

**Renealmia mexicana** Petersen. Reported for the Atlantic coast, but it is probable that the specimens belong to one of the species described by the present writer. Otherwise the species is known from Guatemala and Mexico.

### ZINGIBER Adans. Ginger

**Zingiber officinale** Roscoe. *Gengibre.* A plant of Asiatic origin, cultivated commonly in gardens for its rhizomes, which are the ginger of commerce. This is employed in infusion as a stomachic, but more commonly as a condiment. It is stated that in Costa Rica ginger is often found naturalized in localities abandoned by man many years ago, a proof that its cultivation here is ancient. It is said that the plant never flowers in Central America.

### CANNACEAE. Canna Family

Reference: Fr. Kränzlin, Cannaceae, Pflanzenreich IV. 47. 1912.

The family is composed of a single genus.

### CANNA L. Canna

Large, perennial herbs with thick rhizomes and large, broad leaves; flowers large and showy, arranged in terminal, simple or branched racemes; fertile stamen 1, the staminodia 1–4, petal-like; fruit a tuberculate capsule.—Besides the native species, there are grown in Costa Rican gardens various forms of hybrid origin. They are known by the local name of Bandera Española, or more often that of Platanillo.

**Canna discolor** Lindl. Wet places in the tierra caliente. Plants 2–3 meters high; leaves purple beneath; petals 4 cm. long, yellow tinged with pink. Extending to Guatemala and Trinidad.

**Canna edulis** Ker. Tierra caliente and in temperate regions, ascending to La Palma, at 1,450 meters or less. Widely distributed in tropical America. Plants 2–3 meters high; leaves green; petals red, 4 cm. long; staminodia 3.

**Canna indica** L. *Platanillo, Piriquitoya* (Nicoya). Meseta Central to the coasts, abundant in moist or swampy places, sometimes growing in shallow water. Widely distributed in tropical America. Plants 1–1.5 meters high, the leaves green; flowers red, the petals short. The leaves of this and other species are much used for wrapping small articles. Pittier states that they are employed in domestic medicine as a diuretic, and that the roots are used for preparing emollient poultices. The Brunka name is reported as Táa-krá.

**Canna lutea** Mill. Reported for Costa Rica by Kränzlin, without indication of the locality. Plants 1 meter high; flowers yellow; staminodia 2. Mexico to Brazil.

**Canna Warscewiczii** Dietr. in Otto & Dietr. Allgem. Gartenzeit. 19: 290. 1851. Type collected by Warscewicz, without indication of the locality. Meseta Central to Guanacaste. Ranging southward to Argentina. Plants 1.5–2.5 meters high; flowers orange-red, the petals 4 cm. long; staminodia 3, as much as 6–7 cm. long.

## MARANTACEAE. Arrowroot Family

Reference: K. Schumann, Pflanzenreich IV. 48. 1902.

Usually large but sometimes small herbs, perennial, the leaves broad, petiolate; flowers large or small, bracted, with a single stamen and one or more staminodia.

### CALATHEA Mey.

Flowers arranged in a dense spike or head. Some plants of this family are very handsome and showy, and are cultivated in northern hothouses.

**Calathea albicans** Brongn. Wet forests of the Atlantic coast, ascending to Pejivalle (900 meters); region of San Ramón. A small plant, 20–30 cm. high, the leaves more or less striped with light and dark green; flowers white.

**Calathea altissima** (Poepp. & Endl.) Koern. Wet forests of the Atlantic coast. A tall plant, the leaves large, purple on the lower surface; corollas yellow. Central America to Brazil.

**Calathea barbillana** Cufodontis, Ann. Naturhist. Mus. Wien 46: 235. 1933. Finca Waldeck, 28 miles from Limón, Río Barbilla, *Cufodontis 581*. Endemic. Plants 2 meters high.

**Calathea Brenesii** Standl., sp. nov.—Herba erecta ut videtur circiter 1 m. alta praeter bracteas omnino glabra, scapo gracillimo striato prope medium folio longipetiolato onusto; folia basalia disticha, petiolo gracillimo circiter 60 cm. longo, lamina ovali vel ovato-ovali membranacea ca. 25 cm. longa et 12 cm. lata abrupte breviter cuspidato-acuminata, basi aequali acutata, utrinque viridi, nervis numerosissimis prominentibus; pedunculus petiolis fere aequilongus gracillimus spica simplici terminatus; spica erecta 7 cm. longa 3.5 cm. lata valde compressa, bracteis distichis lateraliter compressis firme membranaceis in sicco pallidis latissimis apice late rotundatis et breviter apiculatis dense nervosis prope apicem sparse adpresso-pilosulis.—La Palma de San Ramón, August, 1935, *Brenes 20609* (type in Herb. Field Mus.). Well marked by the inflorescence which consists of a single simple spike with distichous, compressed, thin bracts.

**Calathea cleistantha** Standl. Journ. Wash. Acad. Sci. 17: 250. 1927. Wet forests near Guápiles, 400 meters, *Standley 37114*. Endemic. A low plant, the leaves 25 cm. long; peduncle arising directly from the rhizome, only 1.5 cm. long, the spike composed of only 5 bracts.

**Calathea Donnell-Smithii** Schum. Pflanzenreich IV. 48: 75. 1902. Aguacate, *Friedrichsthal 1282*. Also on the Atlantic coast; region of San Ramón, 1,100 meters. Plant 50 cm. high or larger. Endemic.

**Calathea hirsuta** Standl. Palm swamp, Finca Castilla, Prov. Limón, *Dodge & Nevermann 5811*. Also in Panama. Plants about a meter high, soft-hirsute throughout, the leaves all basal, very thin, large, abruptly short-acuminate; scape very slender, the spike short, with only 4–5 bracts, these thin, 2.5–4 cm. long, narrow, spirally arranged, green; corolla glabrous.

**Calathea insignis** Petersen. *Platanillo, Bijagua.* Abundant on the Atlantic coast, ascending to Dulce Nombre; also on the Atlantic slope of Guanacaste; region of San Ramón. Growing in

open swamps or on river banks, often forming colonies of large extent. Widely distributed in tropical America. Stems as much as 2 meters high; leaves very large, whitish on the lower surface; flower spikes elongate, compressed, yellowish; corolla yellow. Of this showy plant of the tierra caliente Pittier says: "Its leaves serve as wrapping material upon all sorts of occasions. The Indians of Talamanca employ them for artistic wrapping of corpses in preparation for burial, and they are used generally for wrapping salt, tamales, etc.; they even serve to protect travelers against sudden showers." Among Indian names for the plant are: Murúsik (Cabécara); Kranka (Brunka); Durgó (Térraba).

**Calathea lasiostachya** Donn. Smith, Bot. Gaz. 31: 124. 1901. Forests of Río Hondo, Madre de Dios, *Pittier 10344*. Wet forests of the Atlantic coast, ascending to Pejivalle (900 meters); near San Ramón. Also in Panama. Plants 1.5–2 meters tall, with large leaves; flower spikes elongate, compressed, and hairy; bracts tinged with pale brown.

**Calathea lasiostachya** var. **minor** Cufodontis, Ann. Naturhist. Mus. Wien 46: 234. 1933. Finca Hamburgo, Río Reventazón, *Cufodontis 631*. A dwarf plant, only 60 cm. high.

**Calathea leucostachys** Hook. f. Bot. Mag. *pl. 6205*. 1875. Collected in Costa Rica by Endres, without indication of the locality. Endemic. A low plant, 50 cm. high, hairy throughout; bracts yellow.

**Calathea lutea** (Aubl.) Mey. *Platanillo*. Abundant in many parts of the Atlantic coast. A large plant, 2–5 meters high; leaves 1–2 meters long, whitish beneath; flower spikes elongate, little compressed, bronze-colored; corollas yellow. In open swamps and along the banks of streams this plant often forms wide stands. It is one of the most common and characteristic species of the Atlantic coast through most of Central America. Extending to Peru.

**Calathea macrosepala** Schum. Pflanzenreich IV. 48: 84. 1902. *Platanillo*. Aguacate, *Hoffmann 765*. Wet forests, Atlantic and Pacific coasts to the Meseta Central; La Palma; Guanacaste; at 1,400 meters or less. Guatemala to Panama. Plant a meter high, the leaves 40 cm. long; flower spikes 4–8 cm. long, yellowish; corollas yellow.

**Calathea marantifolia** Standl. Journ. Wash. Acad. Sci. 17: 250. 1927. Wet forest, El Arenal, Guanacaste, 485 meters, *Standley*

*& Valerio 45310.* Endemic. A small plant, 60 cm. high; flower spikes 3 cm. long, with 5 yellowish green bracts.

**Calathea panamensis** Rowlee, Journ. Wash. Acad. Sci. 15: 4. 1925. Matambu, Península de Nicoya. Also in Panama. A small plant, about 35 cm. high.

**Calathea Pittieri** Schum. Pflanzenreich IV. 48: 108. 1902. Río Blanco, near Santa Clara, 300 meters, *Pittier 13456.* Endemic. Plants a meter high; flower spikes arising directly from the rhizome.

**Calathea Valeriana** Standl., sp. nov.—Planta nana vix ultra 30 cm. alta; folia omnia basalia, petiolo late alato 18 cm. longo basi paullo dilatato pilis longis densiuscule piloso; lamina membranacea oblongo-ovalis vel obovato-ovalis 19 cm. longa et 9 cm. lata vel major apice rotundata basi obtusa paullo angustata utrinque subdense pilis longis molliter pilosa; scapus dense fulvo-pilosus crassiusculus 21 cm. longus; spica laxa 7.5 cm. longa, bracteis paucis membranaceis spiraliter dispositis valde inaequalibus apice obtusis vel rotundatis ut videtur pallidis ubique dense pilis longis pilosis.—Forests between La Balsa and Cataratas de San Ramón, 850 meters, October, 1925, *Brenes 4531a* (type in Herb. Field Mus.). Distinct in its low habit and copious pubescence. Named for Professor Juvenal Valerio Rodríguez, Director of the Museo Nacional of Costa Rica.

**Calathea violacea** (Rosc.) Lindl. Abundant in wet forests of the coast, ascending to 1,300 meters. Plants a meter high; flower spikes about 7 cm. long, dark red; corolla violet. Ranging to Brazil.

**Calathea Warscewiczii** (Math.) Koern. Gartenflora 7: 87. 1858. *Maranta Warscewiczii* Math. ex Planch. Fl. Serres 9: 939. 1853–54. *Phrygium Warscewiczii* Klotzsch, Allgem. Gartenzeit. 23: 89. 1855. Wet forests of the Atlantic coast. Perhaps endemic. Plants as much as a meter high; leaves striped with light and dark green on the upper surface, purple beneath; spikes whitish.

## CTENANTHE Eichl.

**Ctenanthe dasycarpa** (Donn. Smith) Schum. Pflanzenreich IV. 48: 151. 1902. *Calathea dasycarpa* Donn. Smith, Bot. Gaz. 31: 123. 1901. Forests along the Río Hondo, near Madre de Dios, Prov. Limón, 200 meters, *Pittier 10350.* Also at Agua Buena, Cañas Gordas, 1,100 meters. Endemic. Plants 2 meters high or taller, the leaves almost a meter long; flowers arranged in large panicles.

## ISCHNOSIPHON Koern.

**Ischnosiphon elegans** Standl. Journ. Wash. Acad. Sci. 17: 182. 1927. Wet forest near Tilarán, Guanacaste, 600 meters, *Standley & Valerio 54251*. Endemic in the mountains of Guanacaste. Plants much branched, 1–1.5 meters high, the leaves oblong-obovate, 6–17 cm. long; flower spikes terete, very slender, 20–25 cm. long, the narrow bracts tightly overlapping; corolla white.

## MARANTA L.

**Maranta arundinacea** L. *Sagú*. Wet places of the tierra caliente; region of San Ramón. Also cultivated in some places. A plant of wide distribution in tropical America. Plants slender, branched, tall, the leaves ovate-lanceolate, the flowers white. From the fleshy rhizomes is prepared the starch called arrowroot, in large amounts in some parts of the earth. The plant is grown everywhere along the Atlantic coast of Central America for the use of laundresses. It also grows commonly in forests and thickets, but the wild plants have very slender rhizomes that are useless. In other parts of Central America the plant is called also Yuquilla.

**Maranta Friedrichsthaliana** Koern. Bull. Soc. Nat. Moscou 36: 42. 1862. Aguacate, *Friedrichsthal 1269*. La Balsa de Río Grande; San Mateo. Endemic. Flowers arranged in elongate, spike-like racemes.

## MYROSMA L. f.

**Myrosma guapilensis** Donn. Smith, Bot. Gaz. 23: 251. 1897. Jiménez, Prov. Limón, *J. D. Smith 4970*. Also in Panama. Plants 1–2.5 meters high, the leaves about 30 cm. long and 12 cm. wide; flowers arranged in branched racemes, the bracts 2 cm. long. A plant of wet forest.

**Myrosma Hoffmannii** Schum. Pflanzenreich IV. 48: 145. 1902. Aguacate, *Hoffmann 850*. Region of San Ramón. Endemic. Plants acaulescent, 80 cm. high; bracts of the racemes 4 cm. long.

## PLEIOSTACHYA Schum.

Tall herbs with rhizomes, the leaves broad, with elongate petioles; flowers arranged in large, compressed spikes.

**Pleiostachya Morlaei** (Eggers) Schum. Common in forests of the Atlantic coast. Also in Panama and Ecuador. Plants 1–2 meters high, the bracts covered with long, yellow hairs; corolla white.

**Pleiostachya pruinosa** (Regel) Schum. *P. Morlaei* var. *leiostachya* Donn. Smith, Bot. Gaz. 31: 123. 1901. Wet forests of the Atlantic coast and Guanacaste, at 600 meters or less. Plants 1–2 meters high, the large leaves purple beneath; flowers white. Cultivated in hothouses of Europe for its handsome foliage. Honduras to Panama.

### STROMANTHE Sond.

**Stromanthe Tonckat** (Aubl.) Eichl. Wet forests of Guanacaste; also San Ramón. A branched plant, 1–2 meters high, with the general appearance of *Maranta*, the flowers white, bracted; ovary covered with short, silky hairs; fruit red. Ranging to Brazil.

### THALIA L.

**Thalia geniculata** L. Common in open swamps and shallow lagoons of the coasts, in some places forming very large and dense colonies, often in association with *Calathea*. Widely distributed in tropical America. Plants slender, 1–3 meters tall; leaves large and broad, stiff like heavy paper, the petioles elongate; flowers purple, in panicled racemes. The stiff leaves of this and the tall, swamp-inhabiting Calatheas rattle loudly when blown by a heavy wind, or when shaken by the many water birds that are accustomed to perch upon them.

## BURMANNIACEAE. Burmannia Family

Small herbs, annual or perennial and with rhizomes, green or without chlorophyll, the leaves usually reduced to scales; flowers regular, with 3 or 6 stamens; fruit a small capsule with 1 or 3 cells and very numerous, minute seeds.

### APTERIA Nutt.

**Apteria aphylla** (Nutt.) Barnhart. Grassy places, probably in savannas, at 200–700 meters. A very delicate plant, 5–20 cm. high; flowers pedicellate, purple, 8–12 mm. long.

### BURMANNIA L.

**Burmannia flava** Mart. Buenos Aires, 480 meters, *Manuel Valerio 846*. A Brazilian species, known in North America only from this locality. Plants very slender, the leaves small, linear, forming a rosette; capsule narrowly winged.

**Burmannia Wercklei** Schlechter, Repert. Sp. Nov. 12: 35. 1913. La Palma, 1,750 meters, *Wercklé 687*. Collected also at Turrialba by

Anastasio Alfaro. Endemic. Plants 25 cm. high; leaves linear, as much as 12 cm. long; flowers bright blue, 13 mm. long. A pretty plant, noteworthy for its relatively large flowers.

### DICTYOSTEGIA Miers

**Dictyostegia orobanchoides** (Hook.) Miers. Wet forests at middle elevations. Guatemala to Brazil. A delicate, whitish plant 12–35 cm. high, without leaves; inflorescence bifid, the few pale flowers 7–10 mm. long.

### GYMNOSIPHON Blume

**Gymnosiphon tenella** (Benth.) Urban. In wet forest, the locality not indicated. Plants delicate, 8–17 cm. high; flowers yellowish, 5–8 mm. long. Extending to Brazil.

## ORCHIDACEAE. Orchid Family

*By Oakes Ames*

References: R. Schlechter, Additamenta ad Orchideologiam Costaricensem, Repert. Sp. Nov. Beih. 19: 1–307. 1923: Kritische Aufzählung der bisher aus Zentral-Amerika bekanntgewordenen Orchidaceen, Beih. Bot. Centralbl. 36, Abt. 2: 321–520. 1918.

The Orchidaceae constitute a cosmopolitan family which attains its highest development in the tropics of both hemispheres. About five hundred genera and not less than ten thousand species have been recognized. In Central America the greater part of the species are epiphytes, growing on trees.

### ACINETA Lindl.

A small genus of epiphytic species, several of great beauty, with pendulous or drooping racemes of large flowers. Schlechter, Orchis 11: 21. 1917.

**Acineta chrysantha** (Morr.) Lindl. *A. densa* Lindl. & Paxton in Paxton, Flower Gard. 1: 91. 1850–51 (Turrialba, *Warscewicz*). One collection is referred to this species: Cachí, 1,200 meters, *Lankester 1082*. Also in Mexico and Panama.

**Acineta erythroxantha** Reichenb. f. Schlechter cites one collection of this species from Costa Rica: Candelaria Mountains, *A. & C. Brade 1060*. Also in Mexico.

**Acineta gymnostele** Schlechter. Schlechter in a paper subsequent to the original description (Repert. Sp. Nov. Beih. 19: 49.

1923) cites one collection from Costa Rica: Probably near La Palma, *Wercklé 147*. Original habitat unknown.

**Acineta sella-turcica** Reichenb. f. Schlechter records this species as occurring in Costa Rica. Also in Panama.

### ACOSTAEA Schlechter

Repert. Sp. Nov. Beih. 19: 283. 1923. Diminutive plants with small flowers in slender, upright racemes, suggesting in foliage and floral characters close relationship with the large genus *Pleurothallis*. Endemic, with two species.

**Acostaea costaricensis** Schlechter, Repert. Sp. Nov. Beih. 19: 284. 1923. Vicinity of San Ramón, *Acosta*; also San Jerónimo, *Wercklé 17;* La Palma, *Wercklé 73*, and La Palma, *A. & C. Brade 1119*. Four other collections are referable to this species: *Brenes 579* and *1238*, *Standley 36448* and *38304*. Endemic.

**Acostaea pleurothalloides** Schlechter, Repert. Sp. Nov. Beih. 19: 285. 1923. Vicinity of San Ramón, *Acosta*. Known only from the type collection.

### AMPAROA Schlechter

Repert. Sp. Nov. Beih. 19: 63. 1923. A monotypic genus closely related to *Odontoglossum*. Sepals and petals green; lip yellow-green with a yellow crest. The genus was dedicated to Doña Amparo de Zeledón.

**Amparoa costaricensis** Schlechter, Repert. Sp. Nov. Beih. 19: 65. 1923. La Palma, *Wercklé 129*. One other collection of this species is known: Cachí, *Lankester 1092*.

### ARPOPHYLLUM La Llave & Lex.

A small genus of robust epiphytes, with the little, purplish flowers in dense, upright, cylindrical racemes.

**Arpophyllum giganteum** Hartw. ex Lindl. *A. stenostachyum* Schltr. Repert. Sp. Nov. Beih. 19: 32. 1923 (San Jerónimo, *Wercklé 6*). Several collections from Costa Rica are referable to this species. Also in Mexico and Guatemala.

### ASPASIA Lindl.

Epiphytes with rather showy flowers on elongated flower shoots which arise from the base of a flattened, erect pseudobulb. Schlechter, Gartenfl. 71: 59, 70, 98. 1922.

**Aspasia epidendroides** Lindl. Frequent in Costa Rica; Guanacaste. Also in Nicaragua and Panama.

**Aspasia papilionacea** Reichenb. f. Gard. Chron. n. ser. 6: 100. 1876. Without locality, *Endres s. n.* Known only from the type collection, and Schlechter places it among the insufficiently known species.

**Aspasia principissa** Reichenb. f. Two Costa Rican collections of this species have been examined: Monte Verde, *Stork 1658;* between Río Cimarrones on Waldeck Farm and lake on Monte Verde Farm, *Dodge 7763.* Also in Panama.

### BLETIA Ruiz & Pavón

A widespread genus of usually terrestrial herbs, with rather showy, purplish flowers on a wand-like, lateral shoot.

**Bletia Lankesteri** (A. & S.) Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 3: 41. 1934. *Limodorum Lankesteri* A. & S. Sched. Orch. 10: 78. 1930 (Las Cóncavas, *Lankester 1136*). Known only from the type collection.

**Bletia tuberosa** (L.) Ames, including *B. verecunda* R. Br., *B. purpurea* DC., and *B. alta* Hitchc. ex parte. Rather rare in Costa Rica; Guanacaste. A widely distributed species, occurring from Florida and Mexico to Panama and Venezuela, and also in the West Indies.

### BRACHIONIDIUM Lindl.

Two species in Central America.

**Brachionidium pusillum** Ames & Schweinf. Sched. Orch. 10: 52. 1930. Province of Heredia, Yerba Buena, northeast of San Isidro, 2,000 meters, *Standley & Valerio 49068.* Several other collections, mostly from the vicinity of San Isidro, are referable to this species. Endemic.

**Brachionidium Valerioi** Ames & Schweinf. Sched. Orch. 10: 53. 1930. Cerros de Zurquí, northeast of San Isidro, 2,000–2,400 meters, *Standley & Valerio 50759.* Two other collections are referable to this species: Cerro de Las Caricias, north of San Isidro, 2,000–2,400 meters, *Standley & Valerio 52366* and *52419.* Endemic.

### BRASSAVOLA R. Br.

Fleshy-leaved epiphytes with large, white or yellowish flowers. Rolfe, Orch. Rev. 10: 65. 1902; Schlechter, Orchis 13: 40, 58, 71. 1919.

**Brassavola acaulis** Lindl. & Paxt. Schlechter cites Costa Rica as the habitat of this species; Rolfe gives Guatemala. Only cultivated specimens have been seen.

**Brassavola nodosa** (L.) Lindl. Three collections of this species from Costa Rica have been examined: Salinas, Pacific slope, 10 meters, *Brenes 268;* Osa Peninsula at Golfo Dulce, near Puerto Jiménez, *Cufodontis* (*Oesterr. Biol. Costarica Exped. 163*); and Guanacaste Province, La Cruz, *Jiménez 6266*. Also in Mexico, British Honduras, Guatemala, Honduras, Panama, South America, and West Indies.

**Brassavola scaposa** Schlechter, Orchis 13: 77. 1919. Near San José. Known only from the book citation.

## BRASSIA R. Br.

Epiphytes, usually with the labellum and narrow, elongate, sometimes caudate sepals and petals conspicuously spotted.

**Brassia caudata** (L.) Lindl. One collection from Costa Rica is probably referable to this species: Province of Limón, La Colombiana Farm, 70 meters, *Standley 36905*. A widely distributed species from Florida, Mexico(?), Guatemala(?), Panama, and West Indies.

**Brassia chlorops** Endres & Reichenb. f. Gard. Chron. 1873: 542. 1873. Without locality, *Endres. B. parviflora* Ames & Schweinf. Sched. Orch. 8: 74. 1925 (Cascajal, 1,700 meters, *Alfaro s. n.*). Two other collections are known: La Palma, *Brenes (38)368;* Candelaria Mountains, *A. & C. Brade 1181*. Endemic.

**Brassia Gireoudiana** Reichenb. f. & Warsc. Allg. Gartenz. 22: 273. 1854. Without locality, *Warscewicz. Oncidium Gireoudianum* Reichenb. f. in Walp. Ann. Bot. 6: 768. 1863. Three other Costa Rican collections are referred to this species: "La Calera" de San Mateo, *Brenes 260;* vicinity of Santa María de Dota, *Standley & Valerio 43369;* and near Quebradillas, about 7 km. north of Santa María de Dota, *Standley 42937*. Also in Panama.

**Brassia longissima** Schlechter, Orchideen 496. 1914. Without locality. A number of collections are referred to this species. Endemic.

## BRENESIA Schlechter

Repert. Sp. Nov. Beih. 19: 199. 1923. Only one species known. The genus was named in honor of Professor Alberto M. Brenes, in well merited recognition of his devotion to this group of plants.

**Brenesia costaricensis** Schlechter, Repert. Sp. Nov. Beih. 19: 200. 1923. San Pedro de San Ramón, 1,200 meters, *Brenes 117*. Known only from the type collection.

## BULBOPHYLLUM Thouars

The American species of this enormous Old World genus are characterized by a much swollen rhachis on which the small flowers are arranged in two ranks.

**Bulbophyllum aristatum** (Reichenb. f.) Hemsl. Three Costa Rican collections are probably referable to this species: Province of Limón, Hamburg Finca, on the Río Reventazón below Cairo, *Standley & Valerio 48891;* Province of Guanacaste, El Arenal, *Standley & Valerio 45122* and *45129*.

**Bulbophyllum pachyrachis** (A. Rich.) Griseb. *B. vinosum* Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 411. 1918 (forests of Nicoya, *Tonduz s. n.*). One collection from Costa Rica belongs to this species: Vicinity of Guápiles, 300–500 meters, *Standley 37522*. Also in Guatemala, Panama, and West Indies.

## CALANTHE R. Br.

A large Old World genus with only one species in tropical America.

**Calanthe mexicana** Reichenb. f. Several collections of this species from Costa Rica have been examined. Also in Mexico, Guatemala, and West Indies.

## CAMARIDIUM Lindl.

This is a highly technical genus, very closely related to *Maxillaria*. Epiphytes with usually small, whitish or yellowish flowers.

**Camaridium Adolphii** Schlechter, Repert. Sp. Nov. Beih. 19: 58. 1923. *Ornithidium Tonduzii* Schltr. Repert. Sp. Nov. 3: 250. 1906, non *C. Tonduzii* Schltr. (banks of Río Angel, Poás, 2,600 meters, *Tonduz 10770*). One other collection is referable to this species: Rancho Flores, *Tonduz 2083*. Endemic.

**Camaridium Amparoanum** Schlechter, Repert. Sp. Nov. Beih. 19: 56. 1923. San Jerónimo, 1,460 meters, *Wercklé 122*. Known only from the type collection.

**Camaridium Biolleyi** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 498. 1918. *Ornithidium Biolleyi* Schltr. Repert. Sp. Nov.

9: 29. 1910 (forests of Térraba, 2,600 meters, *Pittier 3859*). Several collections of this species have been examined. Endemic.

**Camaridium bracteatum** Schlechter, Repert. Sp. Nov. Beih. 19: 57. 1923. *Ornithidium bracteatum* Schltr. Repert. Sp. Nov. 9: 217. 1911 (near La Palma, 1,250 meters, *Tonduz 12344*). Two collections are referred (ex char.) to this species: Viento Fresco, *Standley & Torres 47717* and *47816*. Endemic.

**Camaridium Bradeorum** Schlechter, Repert. Sp. Nov. Beih. 19: 141. 1923. La Palma, 1,400 meters, *A. & C. Brade 1089*. One other collection is referred to this species by Schlechter: San Jerónimo, *Wercklé 9*. Endemic.

**Camaridium Brenesii** Schlechter, Repert. Sp. Nov. Beih. 19: 237. 1923. Distrito Volis de San Ramón, 1,275 meters, *Brenes 233*. Known only from the type collection.

**Camaridium costaricense** Schlechter, Repert. Sp. Nov. 3: 250. 1907. Near La Palma, 1,550 meters, *Tonduz 12429*. *C. Tonduzii* Schltr. Repert. Sp. Nov. 8: 571. 1910 (near La Palma, 1,550 meters, *Tonduz 12429*). Several collections of this species have been examined. Endemic.

**Camaridium dendrobioides** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 415. 1918. San Ramón, 1,500–1,600 meters, *Tonduz (Herb. Mus. Nac. Costa Rica 17620)*. *C. Jimenezii* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 416. 1918 (La Palma, *Wercklé 855*). *C. simile* Schltr. Repert. Sp. Nov. Beih. 19: 239. 1923 (San Pedro de San Ramón, *Brenes 64*). Common; in Guanacaste. Endemic.

**Camaridium minus** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 417. 1918. La Palma, *Wercklé* (*Herb. Inst. Phys.-Geogr. Nat. Costaric. 11563*). A large number of collections are referable to this species. Endemic.

**Camaridium nutantiflorum** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 417. 1918. La Palma, 1,500 meters, *Wercklé* (*Herb. O. Jiménez 859*). *C. vinosum* Schltr. Repert. Sp. Nov. Beih. 19: 240. 1923, non Rolfe, 1922 (Distrito Volis de San Ramón, *Brenes 234*). Many collections are referable to this species. Endemic.

**Camaridium ochroleucum** Lindl. *Maxillaria Camaridii* Reichenb. f. Reichenbach cites this species from Costa Rica: Agua Caliente, *Oersted*. Also in Guatemala, Panama, Trinidad, and British Guiana.

## CAMPYLOCENTRUM Benth.

A genus of small, epiphytic plants with distichous leaves and slender, upright racemes of small flowers. In *C. Sullivanii*, however, there are no leaves, the roots being greenish and functioning as leaves. Rolfe, Orch. Rev. 11: 245. 1903.

**Campylocentrum acutum** Schlechter, Repert. Sp. Nov. Beih. 19: 268. 1923. Santiago de San Ramón, 1,075–1,100 meters, *Brenes 147*. Known only from the type collection.

**Campylocentrum Brenesii** Schlechter, Repert. Sp. Nov. Beih. 19: 268. 1923. San Pedro de San Ramón, 1,075 meters, *Brenes 127*. Several other collections have been examined. Also in Guatemala.

**Campylocentrum longicalcaratum** Ames & Schweinf. Sched. Orch. 10: 111. 1930. La Estrella, *Lankester 1013*. Two other collections are referred to this species: La Palma, *Brenes (32)362* and *(139)469*. Endemic.

**Campylocentrum micranthum** (Lindl.) Rolfe. Rather frequent in Costa Rica; Guanacaste. Mexico, British Honduras, Guatemala, Nicaragua, Panama, South America, and West Indies.

**Campylocentrum parvulum** Schlechter, Repert. Sp. Nov. Beih. 19: 157. 1923. La Palma, 1,400 meters, *A. & C. Brade 1294*. Two other collections of this species have been examined: Vicinity of Pejivalle, *Standley & Valerio 47048*, and El Silencio, near Tilarán, *Standley & Valerio 44694*. Endemic.

**Campylocentrum Schiedei** Benth. ex Hemsl. Two collections from Costa Rica are referred (ex char.) to this species: El Silencio, near Tilarán, *Standley & Valerio 44770*, and Agua Caliente, La Quinta, *Lankester 575*. Also in Mexico.

**Campylocentrum Sullivanii** Fawc. & Rendle. *C. Lankesteri* Ames, Sched. Orch. 4: 57. 1923 (Reventazón River, *Lankester 71*). *C. multiflorum* Schltr. Repert. Sp. Nov. Beih. 19: 156. 1923 (Cerro Turubales, *A. & C. Brade 1316*). One other Costa Rican collection has been examined: Pacific Region, Osa Peninsula on the Golfo Dulce, around Puerto Jiménez, Finca Santa María, *Cufodontis 155*. Also in British Honduras, Guatemala, Nicaragua, and West Indies.

## CATASETUM L. C. Rich.

An extraordinary genus of epiphytes in which the flowers may be unisexual, the male and female flowers being strikingly dissimilar;

indeed, the difference between the sexes is sometimes so great that one would hardly suspect that they belonged to a single genus. The male flowers are usually characterized by antenna-like processes at the base of the column. If these processes are touched, the pollen masses are forcibly ejected to a considerable distance. Mansfeld, Repert. Sp. Nov. 30: 257. 1932; 31: 99. 1932.

**Catasetum dilectum** Reichenb. f. Beitr. Orch. Centr. Amer. 73. 1866. Cariblanco, *Wendland 833*. *Catasetum suave* Ames & Schweinf. Sched. Orch. 10: 81. 1930 (La Fuente, 1,200 meters, *Alfaro 162*). One other collection is referable to this species: Carillo, *Lankester 1181*. Endemic.

**Catasetum Oerstedii** Reichenb. f. *C. Brenesii* Schltr. Repert. Sp. Nov. Beih. 19: 225. 1923 (Pacific Coast near Guácimos, 100–150 meters, *Brenes 294*). Mansfeld cites several other collections from Costa Rica. Also in Nicaragua and Panama.

**Catasetum Warscewiczii** Lindl. & Paxt. (as *Warczwitzii*). According to Mansfeld, there is a specimen of this species in Herb. Schlechter collected by Warscewicz in Costa Rica. Also in Panama and South America.

## CATTLEYA Lindl.

One of the most showy and best known genera in the orchid family. The large, rose-purple or rarely white flowers of *Cattleya Skinneri* and the yellow flowers of *C. Dowiana* are favorites of horticulturists everywhere.

**Cattleya aurantiaca** (Batem.) P. N. Don. This is reported from Costa Rica by Schlechter, but no Costa Rican material has been seen. Also in Mexico, Guatemala, and Salvador.

**Cattleya Deckeri** Klotzsch. One collection of this species from Costa Rica has been seen: *Lankester 1113*. Also in Panama.

**Cattleya Dowiana** Batem. Gard. Chron. 1866: 922. 1866. *Guaria de Turrialba*. *Skinner*. *C. labiata* Lindl. var. *Dowiana* Veitch, Man. Orch. Pl. 2: 16. 1887. Several collections of this species are known. Endemic. This is doubtless the most celebrated, at least locally, of all Costa Rican orchids, because of its superb flowers and its relative rarity. The best known region for it is the forests about Turrialba, but it occurs also in other places. Its present rarity is the result of the fact that it has long been sought by commercial orchid collectors.

**Cattleya labiata** Lindl. Stated by Reichenbach to occur in "Turialva." No collection from Costa Rica has been seen. Also in South America and in cultivation.

**Cattleya labiata** Lindl. var. **Warscewiczii** (Reichenb. f.) Veitch. *C. Warscewiczii* Reichenb. f.; *Epidendrum labiatum* Reichenb. f. var. *Warscewiczii* Reichenb. f. Reported from Costa Rica by Schlechter, no specimen seen. Also in Colombia. This variety is a common one in cultivation.

**Cattleya Skinneri** Bateman. *Guaria morada.* Several Costa Rican collections of this species have been seen. Also in Guatemala, Honduras, and Salvador. Of all the showy orchids of Costa Rica this is the one most often seen in gardens of the Meseta Central. It grows wild in abundance in some places on the Pacific slope, and the large clumps, which usually perch high on tall trees, are brought by the country people to their homes and thrown upon the tile roofs, where they become attached. In spring the plants bloom freely, often forming large patches of rich color. The guaria morada is planted freely on trees in commercial gardens about San José, and large bouquets of the flowers are offered for sale on the streets in springtime. A form with white flowers is found very rarely, and large plants of it bring high prices locally.

## CENTROPETALUM Lindl.

Small, epiphytic plants with leafy stems, the leaves in two ranks with small flowers in the axils.

**Centropetalum costaricense** Ames & Schweinf. Sched. Orch. 10: 110. 1930. Near Finca La Cima, above Los Lotes, north of El Copey, 2,100–2,400 meters, *Standley 42600.* Known only from the type collection.

## CHONDRORRHYNCHA Lindl.

In general habit the genus resembles *Warscewiczella.*

**Chondrorrhyncha albicans** Rolfe, Kew Bull. 195. 1898. Without locality, *Hort. Rothschild.* One other collection is referable to this species: Cachí, 1,050–1,500 meters, *Lankester 376.* Endemic.

**Chondrorrhyncha bicolor** Rolfe, Kew Bull. 393. 1894. Without locality, *Pfau s. n.* One collection is perhaps referable to this species: Vicinity of Orosi, *Standley 39892.* Endemic.

**Chondrorrhyncha Endresii** Schlechter, Repert. Sp. Nov. 17: 14. 1921. Without locality, *Endres 166.* Three other collections of

this species are known: La Palma, *Wercklé 119;* El Silencio, *Brenes (16)327;* and La Palma, *Brenes (158)489.* Also in Guanacaste. Endemic.

**Chondrorrhyncha estrellensis** Ames, Sched. Orch. 4: 54. 1923. Estrella de Cartago, *Lankester & Sancho 396.* Known only from the type collection.

**Chondrorrhyncha Reichenbachiana** Schlechter, Repert. Sp. Nov. 17: 15. 1921. Cataratas, *Endres 557.* Known only from the type collection.

### CHYSIS Lindl.

The rather large and showy, fleshy flowers are yellowish or whitish and have a waxen aspect.

**Chysis aurea** Lindl. Three collections of this species from Costa Rica have been examined: San Pedro, *Brenes (1)571;* Taracorí, *Alfaro 111;* Sabanillas de Acosta, *Lankester 1146.* Also in Mexico (?), Panama, and Venezuela.

**Chysis costaricensis** Schlechter, Repert. Sp. Nov. Beih. 19: 297. 1923. Forests of San Ramón, 1,500–1,600 meters, *Tonduz 17631.* Known only from the type collection.

**Chysis tricostata** Schlechter. A collection of this species from Costa Rica is cited by Schlechter: San Jerónimo de Grecia, 1,150 meters, *A. & C. Brade 1325.* Described from cultivated material of uncertain origin.

### COELIA Lindl.

Of this small genus of about four species ranging widely in tropical America only a single species occurs in Costa Rica.

**Coelia macrostachya** Lindl. Two collections from Costa Rica are known: Without locality, *Wercklé s. n.*; Cachí, *Lankester 1080.* Also in Mexico.

### COELIOPSIS Reichenb. f.

A single species with numerous fleshy flowers in a dense, abbreviated raceme; flowers snow-white; throat orange, bordered anteriorly by a circular, purple line.

**Coeliopsis hyacinthosma** Reichenb. f. A drawing in Herb. Reichenbach has the data "Costa Rica—*Endres.*" Two other Costa Rican collections are known: Pozo Azul, Pacific Slope, *Lankester 68;* Sabanillas de Acosta, *Lankester 1238.* Also in Panama.

## COMPARETTIA Poepp. & Endl.

The flowers are small, rose-purple with a deep purple labellum.

**Comparettia falcata** Poepp. & Endl., including *C. rosea* Lindl. A number of collections of this species from Costa Rica have been examined. Also in Guatemala, South America, and West Indies.

## CORYANTHES Hook.

A genus of remarkable species characterized by a cup-like labellum that is partly filled with a watery liquid supplied by glands at the base of the column. Schlechter, Orchis 10: 67. 1916.

**Coryanthes** sp., probably *C. picturata* Reichenb. f. Two collections which are not in condition for certain determination are referred to this species: Reventazón, *Lankester 1189;* Pejivalle, *Lankester 874.*

## CORYMBORCHIS Thouars

Leafy terrestrials with inconspicuous, greenish yellow flowers.

**Corymborchis flava** (Sw.) Kuntze. Terrestrial on Atlantic slope. Also in Mexico(?), Guatemala, Salvador, Nicaragua, and West Indies.

## CRANICHIS Swartz

The species are terrestrial, with the membranaceous leaves more or less clustered near the base; the flowers usually white, in cylindrical racemes at the summit of an elongated stem. Labellum uppermost member of the perianth.

**Cranichis acuminatissima** Ames & Schweinf. Sched. Orch. 10: 12. 1930. Province of Heredia, Cerros de Zurquí, northeast of San Isidro, 2,000–2,400 meters, *Standley & Valerio 50409.* Two other collections from the same locality, *Standley & Valerio 50428* and *52156,* are referable to this species. Endemic.

**Cranichis ciliata** Kunth. *C. Curtii* Schlechter, Repert. Sp. Nov. Beih. 19: 83. 1923 (Tablazo, 1,900 meters, *A. & C. Brade 1261*). *C. irazuensis* Schltr. Repert. Sp. Nov. Beih. 19: 84. 1923 (west slope of Irazú Volcano, 1,700 meters, *A. & C. Brade 1075*). Several specimens of this species from Alajuela, Cartago, and San José have been seen. Also in Guatemala(?), Colombia, Ecuador, and Peru.

**Cranichis guatemalensis** Schlechter. *C. Alfredii* Schltr. Repert. Sp. Nov. Beih. 19: 82. 1923 (Barba Volcano, 2,100 meters, *A. & C. Brade 1262*). Several collections of this species from the

provinces of Alajuela and San José, 1,500–3,000 meters, have been seen. Also in Guatemala.

**Cranichis Lankesteri** Ames, Sched. Orch. 4: 5. 1923. Cachí, *Lankester 81*. Known only from the type collection.

**Cranichis nigrescens** Schlechter, Repert. Sp. Nov. 10: 482. 1912. Without locality, *Tonduz s. n.* Known only from the type collection. Too closely allied to *C. guatemalensis* Schltr.

**Cranichis Pittieri** Schlechter, Repert. Sp. Nov. 11: 41. 1912. Near La División, 2,270 meters, *Pittier 10480*. Known only from the type collection. Too closely allied to *C. guatemalensis* Schltr.

**Cranichis reticulata** Reichenb. f. Beitr. Orch. Centr. Amer. 62. 1866. Desengaño, Alajuela, *Wendland*. Known only from the type collection.

**Cranichis saccata** Ames, Sched. Orch. 4: 6. 1923. Cascajal, 1,650 meters, *Lankester K351*. Two other specimens from the province of San José, *Standley 38873* and *Maxon & Harvey 8097*, are referable to this species. Endemic.

**Cranichis subcordata** Schlechter. *C. costaricensis* Schltr. Repert. Sp. Nov. Beih. 19: 12. 1923 (La Palma, *Wercklé 134*). Four other collections of this species from Costa Rica have been seen. Also in Guatemala.

## CRYPTARRHENA R. Br.

Low herbs with distichous, more or less membranaceous leaves; the flowers, in loose racemes, characterized in part by a four-lobed labellum. Kränzlin, Pflanzenr. IV. 50, Heft 80: 313. 1922.

**Cryptarrhena guatemalensis** Schlechter. *C. quadricornu* Kränzl. in Engl. Pflanzenr. IV. 50, Heft 80: 315. 1922 (low-lying regions, Atlantic Coast, *Endres s. n.*). Three other Costa Rican collections are referred to this species: El Arenal, Guanacaste, *Standley & Valerio 45243* and *45275;* vicinity of Pejivalle, *Standley & Valerio 46889*. Also in Guatemala and British Guiana.

**Cryptarrhena lunata** R. Br. Several Costa Rican collections of this species have been examined; Guanacaste. Also in Mexico (fide Schlechter) and West Indies.

## CRYPTOCENTRUM Benth.

A small genus of epiphytes. Leaves usually clustered, grass-like. *Pittierella* Schltr. Repert. Sp. Nov. 3: 80. 1906.

**Cryptocentrum calcaratum** Schlechter, Repert. Sp. Nov. 12: 214. 1913. *Pittierella calcarata* Schlechter, Repert. Sp. Nov. 3: 81. 1906 (La Palma, 1,700–2,000 meters, *Tonduz 9682*). Several other collections have been examined. Endemic.

**Cryptocentrum gracilipes** Schlechter, Repert. Sp. Nov. Beih. 19: 246. 1923. Los Angeles de San Ramón, 1,000 meters, *Brenes 37*. Known only from the type collection.

**Cryptocentrum gracillimum** Ames & Schweinf. Sched. Orch. 8: 68. 1925. Pejivalle, 690 meters, *Lankester 866*. Known only from the type collection.

**Cryptocentrum latifolium** Schlechter, Repert. Sp. Nov. Beih. 19: 247. 1923. Los Angeles de San Ramón, 1,025 meters, *Brenes 287*. Known only from the type collection.

**Cryptocentrum Standleyi** Ames, Sched. Orch. 9: 55. 1925. La Palma, 1,000 meters, *Standley 33028*. Known only from the type collection.

## CRYPTOPHORANTHUS Rodrigues

A small genus related to *Masdevallia*, characterized by the sepals being adherent at the apex. Rolfe, Orch. Rev. 11: 302. 1903; Kränzlin, Repert. Sp. Nov. Beih. 34: 220. 1925.

**Cryptophoranthus acaulis** Kränzlin, Repert. Sp. Nov. Beih. 34: 232. 1925. Mina Iglesias, Río Barranca, *Endres 62*. Known only from the type collection.

**Cryptophoranthus Endresianus** Kränzlin, Repert. Sp. Nov. 17: 437. 1921. Without locality, *Endres s. n.* Known only from the type collection.

**Cryptophoranthus gracilentus** (Reichenb. f.) Rolfe, Gard. Chron. III. 2: 693. 1887. *Masdevallia gracilenta* Reichenb. f. Gard. Chron. n. ser. 4: 98. 1875 (*Endres*). Endemic.

**Cryptophoranthus pectinatus** Schlechter, Repert. Sp. Nov. Beih. 19: 277. 1923. Vicinity of San Ramón, *Acosta s. n.*

## CYCNOCHES Lindl.

A small genus of remarkable species, characterized in part by the extraordinary dissimilarity between the male and female flowers. The male flowers, borne in an elongated, drooping raceme, are usually spotted on the sepals and petals and have four or more elongated processes on the margin of the labellum. The female

flowers are extraordinarily fleshy, usually erect, and have greenish sepals and petals and a narrowly ovate labellum. Schlechter, Orchis 10: 47. 1916.

**Cycnoches Amparoanum** Schlechter, Repert. Sp. Nov. Beih. 19: 48. 1923. From El Guayabo near Turrialba (cult. in the garden of Mme. Amparo de Zeledón), *Tonduz 49*, also *Wercklé 86*. Probably a variant of *C. Egertonianum* Batem. Endemic.

**Cycnoches aureum** Lindl. & Paxt. Cited by Schlechter as probably occurring in Costa Rica. Also in Panama.

**Cycnoches pauciflorum** Schlechter, Repert. Sp. Nov. Beih. 19: 137. 1923. Santo Domingo, *A. & C. Brade 1088*. Probably a variant of *C. Egertonianum* Batem. Known only from the type collection.

**Cycnoches ventricosum** Bateman. ?*C. Tonduzii* Schltr. Repert. Sp. Nov. Beih. 19: 298. 1923 (San Ramón, *Tonduz s. n.*). One Costa Rican collection is probably referable to this species: Sabanillas, 1,350 meters, *Lankester 1196*. Also in Guatemala.

**Cycnoches Warscewiczii** Reichenb. f. One collection from the Province of Guanacaste has been referred to this species: Vicinity of Tilarán, 500–650 meters, *Standley & Valerio 44932*. This species is probably referable to *C. ventricosum* Batem. Also in Panama.

## CYRTOPODIUM R. Br.

Robust, terrestrial or epiphytic species with membranaceous leaves and heavily spotted, yellow flowers in wide-spreading, many-flowered panicles, the bracts of the panicle large and petal-like, spotted with brown.

**Cyrtopodium punctatum** (L.) Lindl. Schlechter cites one collection of this species from Costa Rica: Pacific coast, *A. & C. Brade 1005*. Widely distributed from Florida, Mexico, and Guatemala to South America and West Indies.

## DIACRIUM Benth.

A small genus suggesting in its habit some species of *Schomburgkia*. The stems are frequently inhabited by ants.

**Diacrium bivalvatulum** Schlechter, Repert. Sp. Nov. Beih. 19: 132. 1923. Puntarenas, *A. & C. Brade 1265*. Schlechter also cites Province of Guanacaste, Miravalles, 400 meters, *A. & C. Brade 1266*. One other collection with old flowers may be referable to this

species: El Coyolar, *Standley 39982*. Possibly referable to *D. bilamellatum* Hemsl. Endemic.

## DICHAEA Lindl.

An interesting genus of epiphytes, characterized by elongated, often pendulous stems, closely distichous leaves, and small, axillary flowers. Kränzlin in Engl. Pflanzenr. IV. 50, Heft. 83: 33. 1923.

**Dichaea Acostaei** Schlechter, Repert. Sp. Nov. Beih. 19: 306. 1923. Vicinity of San Ramón, *Acosta*. Schlechter refers one other collection to this species: Santiago de San Ramón, *Brenes 146*. Endemic.

**Dichaea acroblephara** Schlechter, Repert. Sp. Nov. Beih. 19: 71. 1923. San Jerónimo, *Wercklé 22*. Schlechter refers one other collection to this species: Carillo, *A. & C. Brade 1173*. Endemic.

**Dichaea Amparoana** Schlechter, Repert. Sp. Nov. Beih. 19: 71. 1923. San Jerónimo, *Wercklé 103*. Schlechter refers one other collection to this species: La Palma, *A. & C. Brade 1306*. Endemic.

**Dichaea brachypoda** Reichenb. f. Beitr. Orch. Centr. Amer. 78. 1866. San Miguel, *Wendland s. n. Epithecia brachypoda* Schltr. Orchis 9: 25. 1915. *Dichaeopsis brachypoda* Schltr. Repert. Sp. Nov. Beih. 19: 519. 1923. Reichenbach f. and Schlechter cite this species as occurring in Costa Rica, but no Costa Rican specimens have been seen. Also in Colombia and Surinam.

**Dichaea Bradeorum** Schlechter, Repert. Sp. Nov. Beih. 19: 154. 1923. La Carpintera, *A. & C. Brade 1305*. Schlechter refers two other collections to this species: Borders of the Río Grande at Naranjo de Alajuela, *Brenes 2;* San Pedro de San Ramón, *Brenes 194*. Endemic.

**Dichaea Brenesii** Schlechter, Repert. Sp. Nov. Beih. 19: 264. 1923. San Pedro de San Ramón, 1,075 meters, *Brenes 66*. Known only from the type collection.

**Dichaea ciliolata** Rolfe, Kew Bull. 83. 1917 Near Cachí, *Lankester 12*. A number of collections of this species have been examined; Guanacaste. Endemic.

**Dichaea costaricensis** Schlechter, Repert. Sp. Nov. Beih. 19: 73. 1923. La Palma, *Wercklé 77*, also Carillo, *Wercklé 39*, and San Jerónimo, *Wercklé s. n.* One other collection is referred to this species (ex char.): Bosque en La Palma, *Brenes (40)370*. Endemic.

**Dichaea Dammeriana** Kränzlin in Engl. Pflanzenr. IV. 50, Heft 80: 41. 1923. Without locality, *Endres 66*. Several other collections of this species from Costa Rica have been examined. Also in Colombia.

**Dichaea echinocarpa** Lindl. One Costa Rican collection is referable to this species: Bosque en La Palma, *Brenes (152a)483*, and several other collections are probably referable to it. Closely allied to *D. pendula* (Aubl.) Cogn., to which species Kränzlin reduces it, but the reduction seems hardly justifiable. Also in Jamaica.

**Dichaea graminoides** (Sw.) Lindl. Several Costa Rican collections have been referred to this species. Also in Mexico, Guatemala, Nicaragua, South America, and West Indies.

**Dichaea hystricina** Reichenb. f. Several Costa Rican collections of this species have been examined. Also in West Indies.

**Dichaea Lankesteri** Ames, Sched. Orch. 4: 56. 1923. Cascajal, *Lankester K353*. A number of other collections are referable to this species. Endemic.

**Dichaea Morrisii** Fawc. & Rendle. Several collections from Costa Rica are referred to this species. Also in West Indies and Peru (fide Kränzlin).

**Dichaea muricata** (Sw.) Lindl. A number of collections from Costa Rica are referable to this species. Also in South America and West Indies.

**Dichaea ovatipetala** Schlechter, Repert. Sp. Nov. Beih. 19: 266. 1923. San Pedro de San Ramón, 1,150 meters, *Brenes 196*. Known only from the type collection.

**Dichaea oxyglossa** Schlechter, Repert. Sp. Nov. Beih. 19: 267. 1923. Santiago de San Ramón, 1,075 meters, *Brenes 144*. Schlechter also cites a second collection: San Ramón, *Brenes 181*. Endemic.

**Dichaea panamensis** Lindl. A number of Costa Rican collections are referable to this species. Also in Panama.

**Dichaea pendula** (Aubl.) Cogn. Three collections from Costa Rica are referable to this species: La Palma, *Standley 33120, 33150*, and La Hondura, *Standley 37933*. Also in South America and West Indies.

**Dichaea poicillantha** Schlechter, Repert. Sp. Nov. Beih. 19: 73. 1923. San Jerónimo, *Wercklé 32*. Known only from the type collection.

**Dichaea similis** Schlechter, Repert. Sp. Nov. Beih. 19: 307. 1923. Vicinity of San Ramón, *Acosta*. Known only from the type collection.

**Dichaea Standleyi** Ames, Sched. Orch. 9: 57. 1925. Vicinity of Guápiles, 300–500 meters, *Standley 37440*. Known only from the type collection.

**Dichaea suaveolens** Kränzlin. One Costa Rican collection is referred to this species: La Carpintera, 1,590 meters, *Lankester 471*. It seems probable that this species should be reduced to *D. trichocarpa* Lindl. Also in Guatemala.

**Dichaea trichocarpa** (Sw.) Lindl. A number of Costa Rican collections have been referred to this species. Also in Mexico and West Indies.

**Dichaea Tuerckheimii** Schlechter. Several collections (without flowers) are probably referable to this species. Also in British Honduras and Guatemala.

**Dichaea vaginata** Reichenb. f. ex Kränzlin in Engl. Pflanzenr. IV. 50, Heft 83: 42. 1923. Without locality, *Endres 38*. A large number of sterile collections from Costa Rica have been tentatively referred to this species. Also in Mexico (fide Kränzlin).

**Dichaea verrucosa** Ames & Schweinf. Sched. Orch. 8: 83. 1925. La Fuente, Peralta, 1,140 meters, *Lankester 918*. Rather frequent in Costa Rica; Guanacaste. Endemic.

**Dichaea Wercklei** Schlechter, Repert. Sp. Nov. Beih. 19: 74. 1923. La Palma, *Werckle 79*. Schlechter also cites a second collection from the same locality: *A. & C. Brade 1300*. Endemic.

## ELLEANTHUS Presl

The white or purplish flowers are borne in conspicuously bracteate racemes.

**Elleanthus Albertii** Schlechter, Repert. Sp. Nov. Beih. 19: 162. 1923. Moist trunks of trees, Los Angeles de San Ramón, 1,050 meters, *Brenes 54*. Also in Guanacaste. Endemic.

**Elleanthus Brenesii** Schlechter, Repert. Sp. Nov. 11: 44. 1912. San Ramón to San Jerónimo, about 1,300 meters, *Brenes 61*. Endemic.

**Elleanthus capitatus** (R. Br.) Reichenb. f. Collected in several regions of Costa Rica at various altitudes. A species of wide distribution, from Mexico to Peru.

**Elleanthus caricoides** Nash, Bull. Torr. Bot. Club 34: 119. 1907. Humid region, Finca Navarro, *Maxon 692*. Epiphytic in forest up to 1,190 meters; Guanacaste. Endemic.

**Elleanthus Curtii** Schlechter, Repert. Sp. Nov. Beih. 19: 79. 1923. Road toward Carillo, 700 meters, *A. & C. Brade 1152*. Known only from the type collection.

**Elleanthus glaucophyllus** Schlechter, Repert. Sp. Nov. 8: 567. 1910. Forest near La Palma, about 1,500 meters, *Brade* (*Herb. Inst. Nac. Costar. 16325*). *E. Bradeorum* Schlechter, Repert. Sp. Nov. Beih. 19: 78. 1923 (La Palma, 1,500 meters *Wercklé; Herb. Mus. Nac. Costar. 11593*). Fairly common, 350–2,400 meters. Endemic.

**Elleanthus hymenophorus** Reichenb. f. in Walp. Ann. 6: 480. 1862. Guanacaste. Also in Panama and Colombia.

**Elleanthus laxus** Schlechter. Provinces of Heredia and Cartago, up to 2,400 meters. Also in Panama.

**Elleanthus linifolius** Presl. Several collections from Costa Rica have been examined; Guanacaste. Described from a Peruvian specimen; also in British Honduras, Panama, West Indies, and British Guiana.

**Elleanthus muscicola** Schlechter, Repert. Sp. Nov. Beih. 19: 10. 1923. Without locality, *Wercklé 143*. Turrialba and San Ramón. Endemic.

**Elleanthus poiformis** Schlechter, Repert. Sp. Nov. Beih. 19: 164. 1923. Epiphyte, San Pedro de San Ramón, 1,075 meters, *Brenes 166*. Several collections, mostly from Cartago Province, have been seen. Also in Guanacaste.

**Elleanthus Tonduzii** Schlechter, Repert. Sp. Nov. 8: 567. 1910. Epiphyte near La Palma, 1,500–1,700 meters, *Tonduz 9689*. Common. Also in Nicaragua.

**Elleanthus tricallosus** Ames & Schweinf. Sched. Orch. 8: 51. 1926. Santa Clara de Cartago, *Lankester 562*. Known only from the type collection.

**Elleanthus trilobatus** Ames & Schweinf. One Costa Rican collection of this species has been examined: San Ramón to Esparta, 1,000–1,200 meters, *Brenes 14281*. Also Panama.

**Elleanthus Wercklei** Schlechter, Repert. Sp. Nov. Beih. 19: 11. 1923. San Jerónimo, Pacific slope, 1,400 meters, *Wercklé 75*.

A second collection from La Palma, *Brade 1097*, has been examined. Also in Nicaragua.

## ENDRESIELLA Schlechter

Repert. Sp. Nov. 17: 13. 1921. A monotypic, endemic genus characterized in part by monophyllous pseudobulbs and a pendulous raceme of crowded flowers.

**Endresiella Zahlbruckneriana** Schlechter, Repert. Sp. Nov. 17: 14. 1921. Road from San Ramón to San Carlos, *Endres 512*. Known only from the type collection.

## EPIDENDRUM L.

Reference: Oakes Ames, F. Tracy Hubbard, and Charles Schweinfurth, The genus *Epidendrum* in the United States and Middle America, pp. i–xi, 1–233. 1936.

A vast, polymorphic genus with representatives in all parts of tropical America. Many of the species are characterized by showy flowers of extreme beauty and are frequently cultivated in gardens. There are two well differentiated groups, one with pseudobulbs terminated by one or more leathery leaves, the other with more or less elongated, slender stems with distichous leaves.

**Epidendrum abbreviatum** Schlechter, Repert. Sp. Nov. 3: 107. 1906. Without locality, *Pittier & Tonduz s. n.* Several collections of this species have been examined. Also in Guatemala, Honduras, and Panama.

**Epidendrum adnatum** Ames & Schweinf. Sched. Orch. 8: 41. 1925. Pejivalle, *Lankester 838*. Known only from the type collection.

**Epidendrum Albertii** Schlechter, Repert. Sp. Nov. Beih. 19: 208. 1923. Los Angeles de San Ramón, alt. 1,000 meters, *Brenes 49*. Known only from the type collection.

**Epidendrum Alfaroi** Ames & Schweinf. Sched. Orch. 10: 55. 1930. La Fuente, 1,200 meters, *Alfaro 174*. Known only from the type collection.

**Epidendrum anceps** Jacq. A variable and wide-spread species which is apparently not common in Costa Rica.

**Epidendrum anoglossoides** Ames & Schweinf. Sched. Orch. 10: 56. 1930. Cerros de Zurquí, northeast of San Isidro, 2,000–2,400 meters, *Standley & Valerio 50731*. One other collection certainly belongs to this species: Cerros de Zurquí, *Standley & Valerio 50724*,

and one other collection without flowers is probably referable to it: Viento Fresco, *Standley & Torres 48005*. Endemic.

**Epidendrum anoglossum** Schlechter, Repert. Sp. Nov. 9: 214. 1911. Woods of El General, 600 meters, *Pittier 3524*. A common species. Endemic.

**Epidendrum arcuiflorum** Ames & Schweinf. Sched. Orch. 10: 58. 1930. La Fuente, 1,200 meters, *Alfaro 212*. Two other collections are referable to this species: La Flor, Peralta, *Lankester 1090* (collected by Collarino), and Province of Guanacaste, Los Ayotes, near Tilarán, *Standley & Valerio 45604*. Endemic.

**Epidendrum atropurpureum** Willd. A wide-spread and variable species, found from Mexico to Peru. Frequently cultivated. Sometimes cultivated in San José as *E. macrochilum* Hook.

**Epidendrum barbae** Reichenb. f. Beitr. Orch. Centr. Amer. 83. 1866. Barba Volcano, *Wendland*. Two collections seem referable to this species: Las Lajas de San Isidro, *Pittier s. n.*, and Las Nubes, *Standley 38906*. Endemic.

**Epidendrum Barbeyanum** Kränzlin, Bull. Herb. Boiss. 3: 607. 1895. Without locality *Tonduz s. n. E. Amparoanum* Schltr. Repert. Sp. Nov. Beih. 19: 34. 1923 (San Jerónimo, *Wercklé 10*). Several collections of this species from San José and Alajuela provinces have been seen. Endemic.

**Epidendrum bilobatum** Ames, Sched. Orch. 7: 3. 1924. Cachí, 1,200 meters, *Lankester 509*. Several collections have been seen; Guanacaste. Endemic.

**Epidendrum bracteosum** Ames & Schweinf. Sched. Orch. 10: 59. 1930. Cerro de Las Vueltas, 2,700–3,000 meters, *Standley & Valerio 43663*. Known only from the type collection.

**Epidendrum Brassavolae** Reichenb. f. One collection of this species from Costa Rica has been seen: South of Cartago, *Lankester 799*. Also found sparingly from Mexico to Panama.

**Epidendrum Brenesii** Schlechter, Repert. Sp. Nov. Beih. 19: 209. 1923. San Pedro de San Ramón, 1,050 meters, *Brenes 118*. Several collections of this species have been seen. Endemic.

**Epidendrum campylostalix** Reichenb. f. Bot. Zeit. 10: 730. 1852. Without locality, *Warscewicz*. Rather common in Costa Rica. Also in Panama.

**Epidendrum Carolii** Schlechter, Repert. Sp. Nov. Beih. 19: 35. 1923. San Jerónimo, 1,400 meters, *Wercklé 101*. Several collections have been seen. Endemic.

**Epidendrum centradenia** Reichenb. f. in Walp. Ann. 6: 1163. 1865. *Oerstedella centradenia* Reichenb. f. Bot. Zeit. 10: 932. 1852 (Isara, *Oersted*). *E. tenuiflorum* Schltr. Repert. Sp. Nov. 3: 49. 1906 (Agua Caliente, 1,300 meters, *Pittier 38*). Frequent in Costa Rica; Guanacaste. Extending to Panama.

**Epidendrum centropetalum** Reichenb. f. *E. leprosum* Schltr. Repert. Sp. Nov. Beih. 19: 38. 1923 (La Palma, *Wercklé 38*). A number of collections from Costa Rica have been examined. Also in Guatemala, Honduras, and Panama.

**Epidendrum chinense** (Lindl.) Ames. Fairly common in the Province of San José. Also in Mexico, Guatemala, Salvador, and Honduras.

**Epidendrum ciliare** L. A common, widely distributed species, ranging from Mexico to Brazil, and in the West Indies.

**Epidendrum circinatum** Ames, Sched. Orch. 7: 4. 1924. Peralta, 300 meters, *Lankester 477*. One other collection from the same locality has been seen: *Lankester 844*. Endemic.

**Epidendrum cnemidophorum** Lindl. *E. Pfavii* Rolfe, Kew Bull. 393. 1894 (without locality, *Pfau 214*). Several collections of this species from Costa Rica have been examined. Also in Guatemala, Honduras, and Nicaragua.

**Epidendrum cochleatum** L. *E. cochleatum* L. var. *costaricense* Schltr. Repert. Sp. Nov. Beih. 19: 118. 1923 (San Jerónimo de Grecia, 1,150 meters, *A. & C. Brade 1141*). A widely distributed species, occurring from Mexico to Venezuela and Colombia, also in the West Indies, and represented in Florida by var. *triandrum* Ames.

**Epidendrum concavilabium** C. Schweinf. Bot. Mus. Leafl. Harv. Univ. 4: 118. 1937. Colinas de San Pedro de San Ramón, *Brenes 1660*.

**Epidendrum confertum** Ames & Schweinf. Sched. Orch. 10: 61. 1930. *E. prostratum* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 407. 1918, non Cogn. (La Palma, 1,750 meters, *Wercklé; Herb. O. Jiménez 683*). The following collections, though lacking flowers, are referred to this species: *Standley & Valerio 50804, 50867, 50159;* and also (with

flowers) Cerros de Zurquí, northeast of San Isidro, *Standley & Valerio 50830*. Endemic.

**Epidendrum congestum** Rolfe, Kew Bull. 29. 1913. *Hort. Glasnevin. E. serruliferum* Schltr. Repert. Sp. Nov. Beih. 19: 44. 1923 (La Palma, *Wercklé 114*). Rather frequent; Guanacaste. Endemic.

**Epidendrum coriifolium** Lindl. *E. magnibracteatum* Ames, Sched. Orch. 1: 16. 1922, non Kränzl. (La Palma, *Tonduz 9688*). *E. palmense* Ames, Sched. Orch. 2: 33. 1922. *E. subviolascens* Schltr. Repert. Sp. Nov. Beih. 19: 219. 1923 (San Pedro de San Ramón, 900 meters, *Brenes 174*). Frequent in Costa Rica. Also in Panama, Ecuador, and Peru. A very variable species.

**Epidendrum crassilabium** Poepp. & Endl. *E. baculibulbum* Schltr. Repert. Sp. Nov. Beih. 19: 116. 1923 (La Palma, 1,400 meters, *A. & C. Brade*). Several collections of this species from Costa Rica have been examined. Also in South America and West Indies. This species in the past was called *E. variegatum* Hook.

**Epidendrum crescentilobum** Ames, Sched. Orch. 4: 37. 1923. Cascajal, 1,650 meters, *Lankester 60*. A number of collections have been examined. Endemic.

**Epidendrum criniferum** Reichenb. f. Gard. Chron. 1291. 1871. Without locality, *Hort. Veitch* (*Endres*). The following collections are referred to this species: Paso del Río Coto, *Pittier 11191* (Herb. Schlechter); El Silencio, Guanacaste, *Standley & Valerio 44790;* and Los Ayotes, Guanacaste, *Standley & Valerio 45474*. Also Peru.

**Epidendrum Deamii** Schlechter. Common in Costa Rica. Also in Mexico, Guatemala, Honduras, and Panama. This species has previously been known as *E. tessellatum* Bateman. Very variable.

**Epidendrum dentiferum** Ames & Schweinf. Sched. Orch. 8: 42. 1925. Pejivalle, *Lankester 843*. *E. platychilum* Schltr. Repert. Sp. Nov. Beih. 19: 42. 1923, non Schltr. 1921 (San Jerónimo, *Wercklé 20*). Known only from the type collections.

**Epidendrum difforme** Jacq. Frequent. A very variable and widely distributed species, occurring from Florida and Mexico to Peru and the West Indies.

**Epidendrum difforme** Jacq. var. **firmum** (Reichenb. f.) Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 2: 55. 1934. *E. firmum* Reichenb. f. Beitr. Orch. Centr. Amer. 87. 1866

(Naranjo to Cartago, *Wendland 1135*). *E. majale* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 406. 1918 (San Ramón, 1,500–1,600 meters, *Tonduz; Herb. Mus. Nac. Costa Rica 17620*). Frequent. Endemic.

**Epidendrum difforme** Jacq. var. **Storkii** (Ames) Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 2: 56. 1934. *E. Storkii* Ames, Sched. Orch. 7: 10. 1924 (mountains south of Cartago, *Stork 460*). A number of collections of this variety have been examined. Endemic.

**Epidendrum dolabrilobum** Ames & Schweinf. Sched. Orch. 8: 43. 1925. Las Cóncavas, *Lankester 769*. Three other collections are referable to this species: Las Cóncavas, *Lankester 961;* La Fuente, *Alfaro 106;* and Dulce Nombre, *Standley 35899*. Endemic.

**Epidendrum Endresii** Reichenb. f. Gard. Chron. n. ser. 19: 432. 1883. El Tablazo, *Endres s. n. E. Adolphii* Schltr. Repert. Sp. Nov. 3: 108. 1906 (El Tablazo, 1,800 meters, *Tonduz; Herb. Inst. Phys.-Geogr. Costar. 7950*). Frequent, especially in San José Province. Also in Panama.

**Epidendrum equitantifolium** Ames. Piedades near San Ramón, 1,025 meters, *Brenes 1370*. Mexico to Panama and southeast to Martinique.

**Epidendrum estrellense** Ames, Sched. Orch. 4: 39. 1923. La Estrella, *Lankester & Sancho 379*. Known only from the type collection.

**Epidendrum exasperatum** Reichenb. f. Beitr. Orch. Centr. Amer. 87. 1866. Naranjo to Cartago, *Wendland*. *E. chondranthum* Kränzl. Vierteljahrschr. Naturf. Ges. Zürich 74: 136. 1929 (near San Ramón, 1,500–1,600 meters, *Tonduz; Herb. Mus. Nac. Costa Rica 17622*). Common, but apparently not in Guanacaste. Endemic.

**Epidendrum exiguum** Ames & Schweinf. Sched. Orch. 10: 63. 1930. Vicinity of Pejivalle, 900 meters, *Standley & Valerio 47036*. Known only from the type collection.

**Epidendrum exile** Ames, Sched. Orch. 4: 40. May, 1923. La Estrella, *Lankester & Sancho 430*. *E. oxyglossum* Schltr. Repert. Sp. Nov. Beih. 19: 40. November, 1923 (La Palma, *Wercklé 127*). Several collections of this species have been examined. Endemic.

**Epidendrum fragrans** Swartz. Fairly common in Costa Rica. Widely distributed, from Guatemala to Peru, and in the West Indies.

**Epidendrum fundi** Ames, Sched. Orch. 9: 50. 1925. Southern slope of Turrialba Volcano, 2,000–2,400 meters, *Standley 35080*. Another collection (*Standley 35119*) from the same locality is this species and a collection (*Jiménez 2028*) in fruit from the Province of Alajuela is probably referable to it. Endemic.

**Epidendrum goniorhachis** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 462. 1918. *E. fractiflexum* Lehm. & Kränzl. Bot. Jahrb. 26: 468. 1899, non Rodr. (Agua Caliente, *Lehmann 1077*). Four collections of this species besides the type have been examined. Endemic.

**Epidendrum guanacastense** Ames & Schweinf. Sched. Orch. 10: 64. 1930. El Arenal, 485–600 meters, *Standley & Valerio 45089*. One other collection is referable to this species: La Tejona, north of Tilarán, 600–700 meters, *Standley & Valerio 46041*. Endemic in Guanacaste.

**Epidendrum imatophyllum** Lindl. A few Costa Rican collections of this widely distributed species have been seen. Mexico to Peru and Trinidad.

**Epidendrum incomptum** Reichenb. f. One Costa Rican collection has been seen: La Estrella, *Lankester 425*. Also in Guatemala and Panama.

**Epidendrum insulanum** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 404. 1923. Wafer Bay, Cocos Island, *Pittier* (*Herb. Mus. Nac. Costa Rica 16350*). One other specimen from the type locality belongs to this species: *Svenson 335*. Endemic.

**Epidendrum intermixtum** Ames & Schweinf. Sched. Orch. 10: 65. 1930. La Estrella, *Lankester 1009*. Three other collections of this species have been examined: La Fuente, *Alfaro s. n.;* two miles southwest of Agua Caliente, *Stork 1320;* Zurquí, *No. 267* (collector not specified). Endemic.

**Epidendrum ionophlebium** Reichenb. f. Beitr. Orch. Centr. Amer. 103. 1866. Curridabat, *Hoffmann. E. Hoffmannii* Schltr. Repert. Sp. Nov. 16: 444. 1920 (Curridabat, *Hoffmann 570*). Fairly common in Costa Rica. Also in Mexico, Guatemala, Salvador, Honduras, and Panama.

**Epidendrum isomerum** Schlechter. One collection of this species from Costa Rica has been seen: *Pittier & Tonduz 9* (U. S. Nat. Herb.). Also in Mexico, Guatemala, and Honduras.

**Epidendrum lancilabium** Schlechter, Repert. Sp. Nov. Beih. 19: 38. 1923. La Palma, *Wercklé 115*. Several collections are referable to this species. Endemic.

**Epidendrum Lankesteri** Ames, Sched. Orch. 4: 45. 1923. Cascajal, *Lankester 63*. The following collections are referable to this species: *Brenes 1495, 486* and *(33)328;* and *Standley & Valerio 52305* and *52346*. Endemic.

**Epidendrum laterale** Rolfe, Orch. Rev. 20: 280, 319. 1912, nomen tantum; 28: 160. 1920. *Lankester 192*. One other collection of this species has been seen: Las Cóncavas, *Lankester 372*. Endemic.

**Epidendrum Laucheanum** Rolfe. *E. dolichostachyum* Schltr. Repert. Sp. Nov. 3: 79. 1906 (near La Palma, *Pittier; Herb. Inst. Phys.-Geogr. Costar. 10311*). *E. cristobalense* Ames, Sched. Orch. 4: 38. 1923 (San Cristóbal, 1,500–2,400 meters, *Lankester & Sancho 381*). Rather frequent in Costa Rica. Also in Guatemala, Honduras, and Colombia.

**Epidendrum Lindleyanum** (Batem.) Reichenb. f. in Walp. Ann. 6: 375. 1862. *Barkeria Lindleyana* Batem. ex Lindl. Bot. Reg. 28, Misc. 2. 1842 (without locality, *Skinner s. n.*). *Barkeria Lindleyana* Batem. var. *Centerae* Reichenb. f. Gard. Chron. 1597. 1873 (without locality, *Endres s. n.*). Variable in color and size of flower. Several collections from Costa Rica have been examined. Also in Mexico, Guatemala, and Honduras.

**Epidendrum lividum** Lindl. *E. Henrici* Schltr. Repert. Sp. Nov. 3: 108. 1906 (near San José, *Pittier 2176*). Schlechter also cites *Tonduz 8204*. Also in Panama, Colombia, and Venezuela.

**Epidendrum lockhartioides** Schlechter, Repert. Sp. Nov. Beih. 19: 39. 1923. La Palma, *Wercklé 112*. Several collections of this species have been examined. Endemic.

**Epidendrum microcardium** Schlechter, Repert. Sp. Nov. Beih. 19: 39. 1923. El Tablazo, *Wercklé 111*. One other collection of this species has been examined: El Tablazo, 1,900 meters, *A. & C. Brade 1116*. Endemic.

**Epidendrum microdendron** Reichenb. f. Beitr. Orch. Centr. Amer. 84. 1866. Barba Volcano, *Wendland 1048*. Two other Costa Rican collections are referable to this species: La Palma, *Brenes (7)337;* and between Aserrí and Tarbaca, *Standley 34178*. Also in Panama.

**Epidendrum mirabile** Ames & Schweinf. Sched. Orch. 10: 67. 1930. San Ignacio de Aserrí, 1,150 meters, *Alfaro 180.* One other collection of this species is known: El Tablazo, 1,500–1,800 meters, *Lankester 1220.* Endemic.

**Epidendrum miserrimum** Reichenb. f. *E. poaeforme* Schltr. Repert. Sp. Nov. Beih. 19: 43. 1923 (San Jerónimo, 1,400 meters, *Wercklé 17*). One other Costa Rican collection is known: San Pedro de San Ramón, 1,075 meters, *Brenes 113.* Also in the West Indies.

**Epidendrum muscicola** Schlechter, Repert. Sp. Nov. Beih. 19: 214. 1923 (as "*muscicolum*"). Los Angeles de San Ramón, 1,050 meters, *Brenes 44. E. linifolium* Ames, Sched. Orch. 7: 7. 1924 (La Palma, *Stork 417*). Fairly common. Endemic.

**Epidendrum nervosiflorum** Ames & Schweinf. Sched. Orch. 8: 47. 1925. La Estrella, 1,650 meters, *Lankester 790.* Two other collections known: La Estrella, *Lankester 688;* and La Estrella, *Standley 39438.* Endemic.

**Epidendrum neurosum** Ames. Three Costa Rican collections of this species have been examined: La Fuente, 1,200 meters, *Alfaro s. n., 85* (Dec. 15, 1925) and *85* (Dec. 26, 1925). Also in Guatemala and Honduras.

**Epidendrum nocturnum** Jacq. Apparently not common in Costa Rica. A widely distributed species, occurring from Florida to Peru and Bolivia, and in the West Indies.

**Epidendrum notabile** Schlechter, Repert. Sp. Nov. Beih. 19: 121. 1923. La Palma, 1,400 meters, *A. & C. Brade 1280.* Known only from the type collection.

**Epidendrum nutantirhachis** Ames & Schweinf. Sched. Orch. 10: 69. 1930. Three miles northeast of El Copey, 2,100 meters, *Stork 1603.* One other collection from the same locality, 2,250 meters, *Stork 1657.* Endemic.

**Epidendrum obesum** Ames, Sched. Orch. 2: 31. 1923. Las Lajas de San Isidro, 1,800 meters, *Pittier 14053.* Frequent. Also in Nicaragua.

**Epidendrum obliquifolium** Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 3: 73. 1935. Hacienda La Esperanza (La Palma), 1,500 meters, *O. Jiménez 972.* Three other collections of this species have been studied: Santa Clara de Cartago, *Lankester 566;* Alto de La Estrella, *Standley 39572* and *39578.* Endemic.

**Epidendrum ochraceum** Lindl. Frequent in Costa Rica. Also in Mexico, Guatemala, Salvador, and Honduras.

**Epidendrum octomerioides** Schlechter, Repert. Sp. Nov. 3: 248. 1907. Near Tuis, 650 meters, *Tonduz 11378*. Several collections of this species have been examined; Guanacaste. Also in Honduras.

**Epidendrum Oerstedii** Reichenb. f. Bot. Zeit. 10: 937. 1852. San Miguel, *Oersted s. n.* *E. costaricense* Reichenb. f. Bot. Zeit. 10: 937. 1852 (Cartago, El Viejo, *Oersted s. n.*). Rather common in Costa Rica. Also in Panama.

**Epidendrum oncidioides** Lindl. var. **gravidum** (Lindl.) Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 3: 104. 1935. *E. peraltense* Ames, Sched. Orch. 4: 46. 1923 (Peralta, 450 meters, *Lankester & Sancho 378*). Rare in Costa Rica: La Fuente, *Alfaro s. n.* and *246*. This variety occurs from Mexico to Panama, but is not common.

**Epidendrum oncidioides** Lindl. var. **Mooreanum** (Rolfe) Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 3: 106. 1935. *E. Mooreanum* Rolfe, Kew Bull. 199. 1891 (without locality, ex Moore of Glasnevin in Herb. Kew.). *Encyclia Mooreana* Schltr. Orchideen 210. 1914. *Encyclia Tonduziana* Schltr. Repert. Sp. Nov. Beih. 19: 132. 1923 (Cismo near San Jerónimo de Grecia, 2,100 meters, *A. & C. Brade 1274*). *Encyclia Brenesii* Schltr. Repert. Sp. Nov. Beih. 19: 221. 1923 (San José de San Ramón, 1,025 meters, *Brenes 253*). A number of collections of this variety have been seen. Also in Panama.

**Epidendrum oncidioides** Lindl. var. **ramonense** (Reichenb. f.) Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 3: 103. 1935. *E. ramonense* Reichenb. f. Beitr. Orch. Centr. Amer. 81. 1866 (San Ramón. *Wendland 1009*). *Encyclia ramonensis* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 473. 1918. Frequent in Costa Rica. Very variable. Also in Honduras and Panama.

**Epidendrum pachyrachis** Ames. *E. Alfredii* Schltr. Repert. Sp. Nov. Beih. 19: 115. 1923 (Finca Hundrisser, Atlantic Coast, *A. & C. Brade 1271*). The only Costa Rican collection known is the type of *E. Alfredii*. Also in Guatemala.

**Epidendrum paleaceum** (Lindl.) Reichenb. f. Rather common in Costa Rica; Guanacaste. Also in Mexico, Guatemala, Salvador, and Nicaragua. Cogniaux reports it from Cuba and Surinam.

**Epidendrum pallens** Reichenb. f. Beitr. Orch. Centr. Amer. 82. 1866. Barba Volcano, *Wendland*. *E. paucifolium* Schltr. Repert. Sp. Nov. 3: 248. 1907 (near Cuero de Tigre, *Pittier 10515*). Frequent. Endemic.

**Epidendrum paniculatum** Ruiz & Pavón, including *E. floribundum* HBK. *E. turialvae* Reichenb. f. Gard. Chron. 1678. 1871 (Turrialba, *Wendland*). *E. resectum* Reichenb. f. Linnaea 41: 82. 1876 (Costa Rica?, *Zahn s. n.*). *E. piliferum* Reichenb. f. Linnaea 41: 83. 1876 (Chiriquí, *Warscewicz s. n.*). *E. reflexum* Ames & Schweinf. Sched. Orch. 8: 49. 1925 (El Arenal, 600 meters, *Valerio 61*). Frequent and variable in Costa Rica. A polymorphic species of wide distribution, occurring from Mexico to Bolivia.

**Epidendrum paranthicum** Reichenb. f. *E. Sancti Ramoni* Kränzl. Vierteljahrschr. Naturforsch. Gesell. Zürich 74: 137. 1929 (Tremendal near San Ramón, 1,500–1,600 meters, *Tonduz 17617*). Frequent. Also in Guatemala.

**Epidendrum Parkinsonianum** Hook. A few collections of this species from Costa Rica have been seen. Also in Mexico and Honduras.

**Epidendrum Parkinsonianum** Hook. var. **falcatum** (Lindl.) Ames, Hubbard & Schweinf. *E. falcatum* Lindl. var. *Zeledoniae* Schltr. Repert. Sp. Nov. Beih. 19: 37. 1923 (Hort. Mme. Amparo de Zeledón, *Tonduz 132*). One wild Costa Rican collection of this variety has been seen: Irazú, 1,800 meters, *Lankester s. n.* Also in Mexico and Guatemala.

**Epidendrum pentadactylum** Reichenb. f. Frequent, especially in San José Province. Also in Nicaragua.

**Epidendrum phyllocharis** Reichenb. f. Xen. Orch. 3: 11. 1878. Without locality, *Endres s. n.* Endemic.

**Epidendrum physodes** Reichenb. f. Gard. Chron. 289. 1873. Without locality, *Zahn s. n.* One other Costa Rican collection is referred to this species: Near Río Parismina, Reventazón, 15 meters, *Lankester 363*. Also in Mexico and Guatemala.

**Epidendrum platystigma** Reichenb. f. Beitr. Orch. Centr. Amer. 83. 1866. San Miguel, *Wendland 1258*. *E. ramonianum* Schltr. Repert. Sp. Nov. Beih. 19: 217. 1923 (San Pedro de San Ramón, 1,150 meters, *Brenes 101*). Frequent. Endemic.

**Epidendrum polyanthum** Lindl. *E. pergameneum* Reichenb. f. Beitr. Orch. Centr. Amer. 86. 1866 (Desengaño, *Wendland 1257*). *E. quinquelobum* Schltr. Repert. Sp. Nov. Beih. 19: 125. 1923 (Barba Volcano, 2,200 meters, *A. & C. Brade 1124*). A very variable species, rather common in Costa Rica. Also in Mexico, Guatemala, Honduras, Panama, Venezuela, and Brazil.

**Epidendrum polyanthum** Lindl. var. **myodes** (Reichenb. f.) Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 3: 75. 1935. *E. myodes* Reichenb. f. Beitr. Orch. Centr. Amer. 86. 1866 (Naranjo, *Wendland 1111*, also Turrialba, *Wendland*). Fairly frequent. Also in Honduras and Panama.

**Epidendrum polychlamys** Schlechter, Repert. Sp. Nov. 3: 109. 1906. La Palma, *Tonduz* (*Herb. Inst. Phys.-Geogr. Costar. 12492*). Several collections are referable to this species. Endemic.

**Epidendrum Porpax** Reichenb. f. Several Costa Rican collections are referable to this species. Also in Guatemala, Honduras, Nicaragua, Panama, Venezuela, and Peru.

**Epidendrum prismatocarpum** Reichenb. f. *E. Brassavolae* "Rchb. f." as misdetermined by Schltr. Repert. Sp. Nov. Beih. 19: 117. 1923 (Candelaria Mountains, *A. & C. Brade 1199*). Also in Panama.

**Epidendrum Pseudepidendrum** Reichenb. f. Two collections of this species from Costa Rica have been examined: Buenos Aires, Cantón de Osa, 480 meters, *M. Valerio 843;* El General, Prov. San José, *A. F. Skutch 2348*. Also in Panama.

**Epidendrum pseudoramosum** Schlechter. Three Costa Rican collections of this species have been examined: La Palma, *Brenes (21)351* and *509;* El Zanjón, *Lankester 545;* one other collection may belong here: La Hondura, *Standley & Valerio 51804*. Endemic.

**Epidendrum pseudo-Wallisii** Schlechter, Repert. Sp. Nov. Beih. 19: 124. 1923. On the way to Llanuras de San Carlos, Buena Vista, 2,000 meters, *A. & C. Brade 1287*, also Cataratas (Los Angeles) de San Ramón, *Brenes*.

**Epidendrum pumilum** Rolfe, Kew Bull. 171. 1893. *Hort. Sander & Co. E. acrochordonium* Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 400. 1918 (without locality, *Tonduz s. n.*). Several collections of this species have been examined. Endemic.

**Epidendrum purpurascens** Focke. *E. glumibracteum* Reichenb. f. Hamb. Gartenz. 19: 11. 1863 (without locality, *Warscewicz s. n.*, also *Schiller s. n.*). Several collections of this species from Costa Rica have been examined. Also in South America. This species has commonly been known in the past as *E. clavatum* Lindl.

**Epidendrum pygmaeum** Hook. Frequent in Costa Rica, especially in the Province of San José. A widely distributed species, occurring from Florida and Mexico to Brazil and in the West Indies.

**Epidendrum radiatum** Lindl. This species is reported from Costa Rica by Cogniaux and Schlechter, but no specimens from there have been seen. Also in Mexico, Guatemala, and Honduras.

**Epidendrum radicans** Pavón ex Lindl. Frequent in Costa Rica. Also found from Mexico to Panama.

**Epidendrum ramosissimum** Ames & Schweinf. Sched. Orch. 8: 48. 1925. El Calvario, Ujarrás, 1,080 meters, *Lankester 581*. One other collection belongs to this species: Las Cóncavas, *Lankester 1089;* and two collections (without flowers) probably are referable to it: La Hondura, *Standley 36383*, and vicinity of Guápiles, *Standley 37453*. Endemic.

**Epidendrum ramosum** Jacq. *E. flexicaule* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 403. 1918 (La Palma, 1,500 meters *Wercklé s. n.*). *E. modestiflorum* Schltr. Repert. Sp. Nov. Beih. 19: 213. 1923 (San Pedro de San Ramón, 1,075 meters, *Brenes 128*). Common in Costa Rica. A polymorphic, widely distributed species occurring from Mexico to Peru and in the West Indies.

**Epidendrum ramosum** Jacq. var. **imbricatum** (Lindl.) Ames, Hubbard & Schweinf. *E. biflorum* Cogn. Bull. Herb. Boiss. II. 2: 337. 1902, nec Forst. f., nec Ruiz & Pav., nec Rodr. (without locality, *Tonduz s. n.*). *E. Boissierianum* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 459. 1918. *E. santaclarense* Ames, Sched. Orch. 4: 49. 1923 (Cartago, Santa Clara, 1,800–1,950 meters, *Lankester & Sancho 443*). Variable and rather frequent in Costa Rica. Also in Guatemala, Brazil, and West Indies.

**Epidendrum repens** Cogn. Several collections of this species from Costa Rica have been examined. Also in Mexico, Venezuela, and West Indies.

**Epidendrum rigidiflorum** Schlechter, Repert. Sp. Nov. Beih. 19: 127. 1923. La Palma, 1,400 meters, *A. & C. Brade 1289*. Two

other collections from La Hondura are referable to this species: *Standley 37858* and *M. Valerio 816*. Endemic.

**Epidendrum rigidum** Jacq. *E. cardiophorum* Schltr. Repert. Sp. Nov. 9: 214. 1911 (woods of Tsaki, Talamanca, 200 meters, *Pittier 9519*). This widely distributed species is not common in Costa Rica. It occurs in Florida, from Mexico to Bolivia, and in the West Indies.

**Epidendrum rugosum** Ames, Sched. Orch. 6: 74. 1923. Without locality, *Lankester s. n.* A number of collections have been seen. Endemic.

**Epidendrum Sanchoi** Ames, Sched. Orch. 4: 48. 1923. Near Cartago, 1,800 meters, *Lankester & Sancho 384*. A number of collections of this species have been examined. Endemic.

**Epidendrum Sanchoi** Ames var. **exasperatum** Ames & Schweinf. Sched. Orch. 10: 72. 1930. Cerro de Las Lajas, north of San Isidro, 2,000–2,400 meters, *Standley & Valerio 51488*. A number of collections of this variety from the provinces of Heredia and Alajuela have been seen. Endemic.

**Epidendrum Schlechterianum** Ames. *E. congestum* Rolfe ex Schltr. Repert. Sp. Nov. Beih. 19: 118. 1923, non Rolfe (Turrialba, *A. & C. Brade 1162*). *E. congestoides* Ames & Schweinf. Sched. Orch. 10: 61. 1930 (Province of Guanacaste, vicinity of Tilarán, 500–650 meters, *Standley & Valerio 44933*). Several collections of this species from Costa Rica have been examined. Also in Mexico, Guatemala, Honduras, Panama, Trinidad, and South America.

**Epidendrum Schumannianum** Schlechter, Repert. Sp. Nov. 9: 215. 1911. Without locality, *Wercklé s. n.* Two other collections are referable to this species: Carillo, *Wercklé 61*, and Peralta, *Lankester 1225*. Endemic.

**Epidendrum sculptum** Reichenb. f. One Costa Rican collection is referable to this species: Hamburg Finca, on the Río Reventazón below Cairo, *Standley & Valerio 48922*. Also in Honduras (?; fruiting specimen), Panama, and northern South America.

**Epidendrum Selaginella** Schlechter, Repert. Sp. Nov. 3: 48. 1906. On moist cliffs, El Recreo, on the road from Carillo, 1,200 meters, *Cooper 523*. Frequent. Endemic.

**Epidendrum serricardium** Schlechter, Repert. Sp. Nov. Beih. 19: 218. 1923. San Juan de San Ramón, 1,025 meters, *Brenes 254.* Several collections from La Hondura have been examined. Endemic.

**Epidendrum spondiadum** Reichenb. f. Bot. Zeit. 10: 731. 1852. Without locality, *Warscewicz s. n.* Other Costa Rican collections are: Without locality, *Pfau* (Herb. Reichenbach); Las Cóncavas, *Lankester 1115;* and La Fuente, *Alfaro s. n.*, November 21, November 29, and December 15, 1924. Also in Panama and Jamaica.

**Epidendrum Stamfordianum** Bateman. Three collections of this species from Costa Rica have been examined: Orotina, *Lankester 555;* Las Cóncavas, *Standley 36000;* and Estrella Valley, *Alfaro 234.* Also from Mexico to Colombia and Venezuela.

**Epidendrum Standleyi** Ames, Sched. Orch. 9: 52. 1925. Vicinity of Orosi, *Standley 39684.* Three other collections are referable to this species: Vicinity of Orosi, *Standley 39698;* El Muñeco, south of Navarro, *Standley 33779;* and San Cristóbal Road, *Stork 2219.* Endemic.

**Epidendrum Stangeanum** Reichenb. f. Several Costa Rican collections have been examined. Also in Honduras (?; no flowers) and Panama. The Costa Rican material was named *E. glandulosum* Ames, which becomes a synonym.

**Epidendrum stenopetalum** Hook. Two collections of this species from Costa Rica have been examined: Talamanca, *Alfaro s. n.*, and vicinity of Tilarán, *Standley & Valerio 44214.* A widely distributed species, ranging from Mexico to Ecuador and occurring in Trinidad and Jamaica(?).

**Epidendrum strobiliferum** Reichenb. f. A few collections of this species from Costa Rica have been examined. Also in Florida, from Guatemala to Peru, and in the West Indies.

**Epidendrum subnutans** Ames & Schweinf. Sched. Orch. 10: 73. 1930. La Palma, 1,200 meters, *Brenes 593.* La Palma de San Ramón, *Brenes 20635.* Also in Panama.

**Epidendrum subpatens** Schlechter. *E. benignum* Ames, Sched. Orch. 2: 25. 1923 (forests of Nicoya, *Tonduz 13928*). A few collections from Costa Rica have been examined. Also in Panama.

**Epidendrum teretifolium** Swartz. *E. teres* Reichenb. f. Bonplandia 3: 220. 1855, non Thunb. Rather common in Costa Rica. Distributed from Mexico to Venezuela and in the West Indies.

**Epidendrum tetraceros** Reichenb. f. One Costa Rican collection has been seen: Near Quebradillas, about 7 km. north of Santa María de Dota, 1,800 meters, *Standley 43063*. Also in Panama.

**Epidendrum trachythece** Schlechter, Repert. Sp. Nov. 3: 249. 1907. Woods of El Tablazo, 1,800 meters, *Tonduz 7941*. Common. Endemic.

**Epidendrum triangulabium** Ames & Schweinf. Sched. Orch. 10: 75. 1930. La Tejona, north of Tilarán, 600–700 meters, *Standley & Valerio 45970*. One other collection has been examined: El Silencio, near Tilarán, 750 meters, *Standley & Valerio 44825*. Endemic in Guanacaste.

**Epidendrum trianthum** Schlechter, Repert. Sp. Nov. Beih. 19: 296. 1923. Vicinity of San Ramón, *Acosta s. n.* One other collection is referable to this species: Sabanillas de Acosta, *Lankester 1217*. Endemic.

**Epidendrum urostachyum** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 409. 1918. El Tablazo, 1,900 meters, *E. Jiménez* (*Herb. Mus. Nac. Costa Rica 17651*). Known only from the type collection.

**Epidendrum vagans** Ames, Sched. Orch. 6: 76. 1923. Southern flanks of Irazú, 1,500–2,100 meters, *Lankester 461*. Two other collections are referable to this species: Between Aserrí and Tarbaca, *Standley 34095*, and La Carpintera, *Stork 2053*. Endemic.

**Epidendrum varicosum** Bateman. *E. chiriquense* Reichenb. f. Bot. Zeit. 10: 730. 1852 (Costa Rica? and Chiriquí, *Warscewicz*). No material from Costa Rica seen. Also in Mexico, Guatemala, Honduras, and Panama.

**Epidendrum Warscewiczii** Reichenb. f. This species, known only from the type collection which Reichenbach cites as "Costa Rica, Veragua," probably does not occur in Costa Rica as Veraguas certainly is in Panama.

**Epidendrum Wercklei** Schlechter, Repert. Sp. Nov. 3: 48. 1906. Near La Palma, 1,500 meters, *Wercklé 16419*. Several collections of this species have been examined. Endemic.

## EPILYNA Schlechter

Beih. Bot. Centralbl. 36, Abt. 2: 374. 1918. Small, epiphytic plants with numerous alternate, coriaceous leaves and small, inconspicuous flowers.

**Epilyna Jimenezii** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 375. 1918. La Palma, 2,500 meters, *C. Wercklé* (*670* in *Herb. O. Jiménez*). Endemic.

## ERIOPSIS Lindl.

This genus is represented in Middle America by a single species.

**Eriopsis Wercklei** Schlechter, Repert. Sp. Nov. 16: 447. 1920. Carillo, 300 meters, *Wercklé s. n.* Two other collections are referred to this species: Hort. Doña Ida de Ortuño, San José (plant collected at Carillo by Brade), *Lankester 1224*, and San Carlos, *Lankester & Jiménez 506*. Endemic.

## ERYTHRODES Blume

An interesting group of terrestrial species, several of them characterized by iridescent, dark green leaves striate with whitish or silvery markings. Flowers usually white, in slender, erect racemes.

**Erythrodes calophylla** (Reichenb. f.) Ames, Orch. 7: 68. 1922. *Physurus calophyllus* Reichenb. f. Beitr. Orch. Centr. Amer. 64. 1866 (Cuesta de Congo, between Cariblanco and San Brigen, *Wendland 1217*). One other collection is referred to this species: Reventazón, *Lankester 1153*. Endemic.

**Erythrodes clavigera** (Reichenb. f.) Ames, Orch. 7: 70. 1922. *Physurus claviger* Reichenb. f. Bonplandia 4: 211. 1856. No data of collector or place, but given as Costa Rica by Schlechter. Probably also from Mexico on the evidence of a specimen collected by Sessé & Mociño.

**Erythrodes Killipii** Ames. Heredia and Cartago provinces, 1,500–2,400 meters. Also in Panama.

**Erythrodes Lehmannii** (Schltr.) Ames, Orch. 7: 71. 1922. *Physurus Lehmannii* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 379. 1918 (*Lehmann 1757*). Probably referable to *E. vesicifera*. Known only from the type collection.

**Erythrodes nigrescens** (Schltr.) Ames, Orch. 7: 74. 1922. *Physurus nigrescens* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 380. 1918 (*Lehmann s. n.*). Known only from the type collection.

**Erythrodes tridax** (Reichenb. f.) Ames, Orch. 7: 76. 1922. *Physurus tridax* Reichenb. f. Beitr. Orch. Centr. Amer. 64. 1866 (Desengaño, *Wendland 1255*). Endemic.

**Erythrodes vaginata** (Hook.) Ames. Province of Cartago; Guanacaste. Also in Mexico and Guatemala.

**Erythrodes venustula** Ames. One collection from Costa Rica has been seen: Province of Cartago, vicinity of Pejivalle, 900 meters, *Standley & Valerio 47011*. Also in Guatemala.

**Erythrodes vesicifera** (Reichenb. f.) Ames, Orch. 7: 78. 1922. *Physurus vesicifer* Reichenb. f. Beitr. Orch. Centr. Amer. 63. 1866 (Barba Volcano, *Wendland 1059*). Also from the provinces of Alajuela and San José. Endemic.

## EURYSTYLES Wawra

A genus which was originally referred to the Scitamineae. From a study of the original analyses published by Wawra and from a review of available evidence it would seem that Schlechter was justified in transferring the genus to the Orchidaceae.

**Eurystyles auriculata** Schlechter, Repert. Sp. Nov. Beih. 19: 86. 1923. El Tablazo, 1,700 meters, *A. & C. Brade 1076*. Known only from the type collection.

**Eurystyles Standleyi** Ames, Sched. Orch. 9: 9. 1925. El Muñeco, south of Navarro, Province of Cartago, about 1,400 meters, *Standley 33747*. Also from La Hondura, 1,300–1,700 meters, *Standley 36349*. Endemic.

## FREGEA Reichenb. f.

Low, usually epiphytic herbs somewhat resembling *Sobralia*. The purplish flowers are extremely fragile and remain in perfection only a short time.

**Fregea amabilis** Reichenb. f. A number of collections of this species from Costa Rica (mostly from Cartago Province) have been examined. Also in Panama.

**Fregea Wercklei** Schlechter, Repert. Sp. Nov. Beih. 19: 9. 1923. San Jerónimo, 1,350 meters, *Wercklé 60*. Known only from the type collection.

## GALEANDRA Lindl.

A small genus of about 23 species widely distributed in tropical America, with a single representative in Costa Rica. Flowers pale green with the convolute lip white above, the throat ornamented with marginal, radiating, purple stripes.

**Galeandra Beyrichii** Reichenb. f. One Costa Rican collection is referable to this species: La Castilla, Ujarrás, 1,050 meters, *Lankester 1084*. Also in Venezuela.

### GALEOTTIA A. Rich. & Gal.

A rare and insufficiently known genus, which is closely related to *Zygopetalum*.

**Galeottia grandiflora** A. Rich. Schlechter reports this from Costa Rica. Also in Mexico.

### GOMPHICHIS Lindl.

Epiphytic herbs with flaccid leaves clustered at the base of the flower scape. Flowers white, in dense, elongated, cylindrical racemes.

**Gomphichis costaricensis** (Schltr.) Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 3: 37. 1934. *Stenoptera costaricensis* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 375. 1918 (Turrialba, 800 meters, *Tonduz s. n.*). Three other specimens, *Standley 42663*, *42728* from the Province of San José, Finca La Cima, above Los Lotes, north of El Copey, 2,100–2,400 meters, and *Stork 2453* from Poás Lake, are referred to this species. Endemic.

### GONGORA Ruiz & Pavón

Epiphytes with obpyriform pseudobulbs terminated by one or two subcoriaceous, elliptic leaves. Flowers in drooping or pendulous racemes.

**Gongora Amparoana** Schlechter, Repert. Sp. Nov. Beih. 19: 50. 1923. In the garden of Mme. Amparo de Zeledón, San José, 1,100 meters, *Tonduz 55*. Known only from the type collection.

**Gongora armeniaca** Reichenb. f. Several collections of this species from Costa Rica are known. Also in Nicaragua.

**Gongora quinquenervis** Ruiz & Pavón, including *G. maculata* Lindl. Numerous Costa Rican collections of this rather widely distributed species have been seen. Known from Mexico to South America and in the West Indies.

**Gongora unicolor** Schlechter, Repert. Sp. Nov. Beih. 19: 299. 1923. Without locality, *Lankester s. n.*, also Las Mercedes, *Nevermann*. Three other collections are referred to this species: Arenal de San Carlos, *Jiménez & Lankester 2011;* La Fuente, 1,200 meters, *Alfaro 164;* Reventazón, *Lankester 982*. Endemic.

## GOODYERA R. Br.

Usually terrestrial with the dark green leaves sometimes variegated with white or yellow, clustered more or less at the base of an elongated scape which is terminated by a slender, cylindrical, closely flowered raceme.

**Goodyera Bradeorum** Schlechter, Repert. Sp. Nov. Beih. 19: 88. 1923. El Tablazo, 1,900 meters, *A. & C. Brade 1080*. Known only from the type collection.

**Goodyera erosa** (A. & S.) Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 3: 37. 1934. *Epipactis erosa* A. & S. Sched. Orch. 10: 9. 1930. Bosque de C. Laguna, 1,180 meters, *Brenes (100)430*. One other collection is referable to this species: Bosque en La Palma, 1,190 meters, *Brenes (34)364*. Endemic.

**Goodyera micrantha** Schlechter, Repert. Sp. Nov. Beih. 19: 274. 1923. Vicinity of San Ramón, *Acosta s. n.* Known only from the type collection.

**Goodyera modesta** Schlechter, Repert Sp. Nov. Beih. 19: 89. 1923. La Palma, 1,400 meters, *A. & C. Brade 1258*. Known only from the type collection

**Goodyera ovatilabia** Schlechter, Repert. Sp. Nov. Beih. 19: 274. 1923. Turrialba Volcano, *Tonduz s. n.* Three other collections from San José Province belong to this species: *Standley 42155, 42303*, and *43733*. Endemic.

**Goodyera turialbae** Schlechter, Repert. Sp. Nov. Beih. 19: 275. 1923. Turrialba Volcano, 2,000 meters, *Tonduz s. n.* Known only from the type collection.

## GOVENIA Lindl.

A genus of about 20 tall, terrestrial herbs with large, plicate leaves. Flowers in loose, cylindrical racemes.

**Govenia ciliilabia** Ames & Schweinf. Sched. Orch. 10: 80. 1930. Cola de Gallo, *Stork & Chacón 1939*. Known only from the type collection.

**Govenia deliciosa** Reichenb. f. In the Reichenbach Herbarium is a drawing of a specimen collected by Endres in Costa Rica and determined as this species by Reichenbach. Also in Mexico and Guatemala (fide Schlechter).

**Govenia quadriplicata** Reichenb. f. Beitr. Orch. Centr. Amer. 75. 1866. Irazú, *Wendland*. One other collection of this species is

cited by Schlechter: El Tablazo, 1,900 meters, *A. & C. Brade 1909*. Endemic.

**Govenia superba** (La Llave & Lex.) Lindl. Reported from Costa Rica by Schlechter. Also in Mexico and Guatemala.

**Govenia utriculata** (Sw.) Lindl. One collection of this species from Costa Rica has been examined: Irazú, La Cañada, *Lankester 1068*. Also in Mexico, Guatemala, Salvador, and West Indies.

## HABENARIA Willd.

A large genus of terrestrial plants with flaccid, alternating leaves and inconspicuous, usually greenish flowers with the lip produced at base into a conspicuous, slender nectary or spur. Petals often two-parted with the anterior division filiform.

**Habenaria alata** Hook. *H. platantheroides* Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 372. 1923 (La Palma, *Wercklé 1913*). Four Costa Rican collections have been tentatively referred to this species: San Pedro de San Ramón, *Brenes 107;* La Castilla, *Lankester 1096;* Sabanillas de Acosta, *Lankester 1145;* and Las Cóncavas, *Lankester 1236*. Also from Mexico to Panama and West Indies.

**Habenaria Amparoana** Schlechter, Repert. Sp. Nov. Beih. 19: 6. 1923. Without locality, *Wercklé 138*. Endemic.

**Habenaria aviculoides** Ames & Schweinf. Sched. Orch. 10: 1. 1930. Vicinity of Santa María de Dota, *Standley 42118*. Forests of the Pacific slope, 1,500–1,800 meters. Endemic.

**Habenaria Brenesii** Schlechter, Repert. Sp. Nov. Beih. 19: 159. 1923. "La Calera" de San Mateo, *Brenes 95*, about 500 meters. Endemic.

**Habenaria clypeata** Lindl. *H. lactiflora* A. Rich. & Gal. One specimen from San José has been referred to this species: *Pittier 16722*. Reichenbach reported *H. lactiflora* from Desengaño, Alajuela, Pacific coast near San José, 1,200 meters. Also in Mexico and Honduras.

**Habenaria Endresiana** Schlechter, Repert. Sp. Nov. Beih. 19: 272. 1923. Without locality, *Tonduz s. n.* This species is questionably distinct from *H. setifera*. Endemic.

**Habenaria flexuosa** Lindl. One specimen from Carpintera–Cartago, *Gillott* (*Lankester 504*), 1,650 meters. Also in Mexico and Guatemala.

**Habenaria gymnadenioides** Schlechter, Repert. Sp. Nov. Beih. 19: 271. 1923. Without locality *Tonduz s. n.* Endemic.

**Habenaria irazuensis** Schlechter, Repert. Sp. Nov. Beih. 19: 77. 1923. West slope of Mt. Irazú, about 1,400 meters, *A. & C. Brade 1069.* Endemic.

**Habenaria Jimenezii** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 372. 1918. Río Virilla, *O. Jiménez 631.* Near Cartago, 1,200–1,650 meters. Endemic.

**Habenaria Lankesteri** Ames, Sched. Orch. 4: 2. 1923. Jocosal, *Lankester 342.* Region of Cartago, about 2,400 meters. Also British Honduras.

**Habenaria macroceratitis** Willd. Reported from Costa Rica by Schlechter. Also in Mexico, Guatemala, Salvador, and West Indies.

**Habenaria monorrhiza** (Sw.) Reichenb. f. Cartago, 900–1,400 meters. Also in Guatemala; common in West Indies, Colombia, and Peru.

**Habenaria novemfida** Lindl. *H. costaricensis* Schltr. Repert. Sp. Nov. 17: 138. 1921 (between San José and San Juan, 1,100 meters, *Tonduz 17652*). Formerly known as *H. diffusa* A. Rich. & Gal. Also in Mexico, Guatemala, and Salvador.

**Habenaria repens** Nutt. Limón Province, 300–340 meters; Cartago, about 1,400 meters. Also southern United States, Guatemala, Honduras, British Honduras, Panama, West Indies, and South America.

**Habenaria setifera** Lindl. Schlechter records this species as occurring in Costa Rica. Also in Honduras.

**Habenaria verecunda** Schlechter, Repert. Sp. Nov. Beih. 19: 6. 1923. Without locality *Wercklé 144.* Known only from the type collection.

**Habenaria Wercklei** Schlechter, Repert. Sp. Nov. Beih. 19: 7. 1923. Without locality, *Wercklé 141.* Known only from the type collection.

## HEXADESMIA Brongn.

A small genus of epiphytes. *Ramonia* Schltr. Repert. Sp. Nov. Beih. 19: 294. 1923.

**Hexadesmia bifida** Reichenb. f. in Saunders, Refug. Bot. 2: sub. *pl. 113.* 1878. *Hort. Saunders.* Known only from the type collection.

**Hexadesmia brachyphylla** Reichenb. f. Beitr. Orch. Centr. Amer. 89. 1866. Turrialba, *Wendland 512*. Several collections of this species are known. Endemic.

**Hexadesmia brachyphylla** Reichenb. f. var. **longior** Schlechter, Repert. Sp. Nov. Beih. 19: 205. 1923. Río Jesús de San Ramón, 800 meters, *Brenes 259*. Known only from the type collection.

**Hexadesmia crurigera** Lindl. Frequent in Costa Rica. Also in Guatemala and Salvador.

**Hexadesmia fasciculata** Brongn. *H. rigidipes* Schltr. Repert. Sp. Nov. Beih. 19: 206. 1923 (Santiago de San Ramón, 1,075 meters, *Brenes 145*). A number of collections of this species from Costa Rica have been examined. Also in Mexico, Guatemala, and Panama.

**Hexadesmia Jimenezii** Schlechter, Repert. Sp. Nov. Beih. 19: 293. 1923. Without locality, *Jiménez s. n.* Known only from the type collection.

**Hexadesmia micrantha** Lindl. Frequent in Costa Rica. Also in Guatemala, Nicaragua (fide Schlechter), and Panama (fide Reichenbach).

**Hexadesmia Powellii** Schlechter. *H. Acostaei* Schlechter, Repert. Sp. Nov. Beih. 19: 293. 1923 (vicinity of San Ramón, *Acosta s. n.*). Frequent in Costa Rica. Also in Panama.

**Hexadesmia pulchella** Schlechter, Repert. Sp. Nov. Beih. 19: 296, in synon. 1923. *Ramonia pulchella* Schltr. Repert. Sp. Nov. Beih. 19: 295. 1923 (vicinity of San Ramón, *Acosta s. n.*). Frequent. Endemic.

**Hexadesmia stenopetala** Reichenb. f. Reported from Nicaragua and Costa Rica by Schlechter.

## HEXISEA Lindl.

Stems often branching, with leathery, oblong or linear leaves, the flowers of several of the species brilliant scarlet, in terminal, few-flowered clusters. *Costaricaea* Schlechter, Repert. Sp. Nov. Beih. 19: 30. 1923.

**Hexisea Amparoana** (Schltr.) Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 3: 40. 1934. *Costaricaea Amparoana* Schltr. Repert. Sp. Nov. 19: 31. 1923 (La Palma, *Wercklé 126*). A few other collections have been seen; in Guanacaste. Endemic.

**Hexisea bidentata** Lindl. Three collections of this species from Costa Rica have been examined: La Palma, *Alfaro 259;* Maderal de San Mateo, *Brenes 224;* and Province of Guanacaste, Cañón of Río San José, *Dodge & Thomas 6389.* Also in Nicaragua and Panama.

**Hexisea cuniculata** (Schltr.) Ames, Sched. Orch. 9: 48. 1925. *Fractiunguis cuniculatus* Schltr. Repert. Sp. Nov. Beih. 19: 31. 1923 (San Jerónimo, 1,400 meters, *Wercklé 83*). *Fractiunguis cuniculatus* Schltr. var. *gracilis* Schltr. Repert. Sp. Nov. Beih. 19: 204. 1923. Several collections are referable to this species. Endemic.

**Hexisea Lankesteri** Ames, Sched. Orch. 9: 47. 1925. Pacaya, *Lankester 519.* Several other collections have been seen. Endemic.

**Hexisea sigmoidea** Ames & Schweinf. Sched. Orch. 8: 39. 1925. Santa Clara de Cartago, *Lankester 570.* Two other collections have been examined: Yerba Buena, northeast of San Isidro, *Standley & Valerio 49753;* Cerro Gallito, *M. Valerio 70.* Endemic.

## HOMALOPETALUM Rolfe

A small genus of extraordinarily interesting species which are characterized by alternating, one-leaved, diminutive pseudobulbs terminated by a single large flower.

**Homalopetalum costaricense** Schlechter, Repert. Sp. Nov. Beih. 19: 47. 1923. La Palma, *Wercklé* 94. Two other collections are referable to this species: San Pedro de San Ramón, *Brenes 131,* and La Castilla, *Lankester 1057.*

**Homalopetalum pumilio** (Reichenb. f.) Schlechter. *Brassavola pumilio* Reichenb. f.; *Bletia pumilio* Reichenb. f.; *Pinelia pumilio* Schltr. Drawings of this species from records of Costa Rican collections in Herb. Reichenbach have been seen. Also in Mexico and Guatemala.

## HOULLETIA Brongn.

A genus of about 10 species, chiefly South American. In *H. Lansbergii* the flowers are yellowish, heavily spotted with purple.

**Houlletia Lansbergii** Linden & Reichenb. f. There are Costa Rican records (*Endres*) in the Reichenbach herbarium; Schlechter cites one collection from Costa Rica: San Pedro de San Ramón, *Brenes 104;* and one collection from Costa Rica has been examined: La Fuente, *Alfaro 93.* The species occurs also in Guatemala, Venezuela, and Brazil.

## HUNTLEYA Lindl.

A small genus of epiphytes with large, waxy flowers in which the petals are stained with brown-purple at the base. Rolfe, Orch. Rev. 8: 269, 302. 1900.

**Huntleya Burtii** (Endres & Reichenb. f.) Pfitzer in Engl. & Prantl, Nat. Pflanzenfam. 2, Abt. 6: 205. 1889, without proper reference; Rolfe, Orch. Rev. 8: 271. 1900. *Batemania Burtii* Endr. & Reichenb. f. Gard. Chron. 1099. 1872 (without locality, *Endres s. n.*). *Zygopetalum Burtii* Benth. & Hook. f. ex Hemsl. Biol. Centr. Amer. Bot. 3: 251. 1883. Two Costa Rican collections of this species are known: Cartago (in cultivation), *Lankester s. n.*, and Carillo, *Wercklé 27*. Also in Colombia (fide Hemsley).

## HYBOCHILUS Schlechter

Repert. Sp. Nov. 16: 429. 1920. Epiphytes with the paniculate inflorescences of tiny flowers originating from the bases of complanate pseudobulbs.

**Hybochilus inconspicuus** (Kränzl.) Schlechter, Repert. Sp. Nov. 16: 430. 1920. *Rodriguezia inconspicua* Kränzl. Bot. Jahrb. 54: Beibl. 117: 32. 1916 (Candelaria Mountains, *Hoffmann s. n.*). Several collections of this species have been examined. Endemic.

## IONOPSIS HBK.

About eight species, ranging from Florida to Brazil. Flowers usually rose-purple, in a paniculate inflorescence.

**Ionopsis costaricensis** Schlechter, Repert. Sp. Nov. Beih. 19: 62. 1923. Carillo, *Wercklé 25*. Known only from the type collection.

**Ionopsis utricularioides** (Sw.) Lindl. Schlechter cites this species as occurring in Costa Rica: Llanuras de San Carlos, 200 meters, *A. & C. Brade 1308*. Also in Mexico, Honduras, British Honduras, Guatemala, Nicaragua, Panama, and West Indies.

## ISOCHILUS R. Br.

Stems leafy, crowded, terminated by small, usually purplish flowers.

**Isochilus Amparoanus** Schlechter, Repert. Sp. Nov. Beih. 19: 27. 1923. San José, *Tonduz 32*, also *Wercklé 83*. Endemic.

**Isochilus crassiflorus** A. Rich. & Gal. Numerous Costa Rican collections are referable to this species; in Guanacaste. Also in Mexico, Honduras, British Honduras, and Guatemala.

**Isochilus latibracteatus** A. Rich. & Gal. This species is cited by Schlechter as having been collected in Costa Rica: El Tablazo, 1,500 meters, *A. & C. Brade 1153*. Also in Mexico.

**Isochilus linearis** (Jacq.) R. Br. A number of Costa Rican collections have been examined; in Guanacaste. Also in Mexico, Guatemala, Honduras, Salvador, West Indies, and South America.

### JACQUINIELLA Schlechter

A genus of small, tufted epiphytes with semiterete or triquetrous leaves, the stems terminated by minute, inconspicuous, whitish flowers.

**Jacquiniella globosa** (Jacq.) Schlechter. Four collections of this species from Costa Rica have been examined: Dulce Nombre, *Standley 35805;* vicinity of Pejivalle, *Standley & Valerio 47201;* Naranjos Agrios, *Standley & Valerio 46504;* and Hamburg Finca on the Río Reventazón below Cairo, *Standley & Valerio 48742*. Also in Mexico, Guatemala, and West Indies.

### KEFERSTEINIA Reichenb. f.

Small epiphytes, in habit and flower suggesting *Warscewiczella*.

**Kefersteinia alba** Schlechter, Repert. Sp. Nov. 19: 228. 1923. San Pedro de San Ramón, 1,075 meters, *Brenes 284*. Known only from the type collection.

**Kefersteinia costaricensis** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 413. 1918. Hill toward the Río Chirripó, 300 meters, *Pittier 16058*. Possibly one other collection is referable to this species: Reventazón, *Lankester 362*.

**Kefersteinia lactea** Reichenb. f. ex B. D. Jackson in Index Kewensis 2: 4. 1895. Two collections are referable to this species: San Pedro de San Ramón, *Brenes 85*, and La Tejona, north of Tilarán, *Standley & Valerio 46009*. Endemic.

**Kefersteinia microcharis** Schlechter, Repert. Sp. Nov. Beih. 19: 300. 1923. Vicinity of San Ramón, *Acosta*. Known only from the type collection.

**Kefersteinia parvilabris** Schlechter, Repert. Sp. Nov. Beih. 19: 52. 1923. San Jerónimo, *Wercklé 116*. One other collection is referable to this species: Vicinity of Pejivalle, 900 meters, *Standley & Valerio 47026*. Endemic.

**Kefersteinia subquadrata** Schlechter, Repert. Sp. Nov. Beih. 19: 300. 1923. Vicinity of San Ramón, *Acosta*. Known only from the type collection.

**Kefersteinia Wercklei** Schlechter, Repert. Sp. Nov. Beih. 19: 53. 1923. La Palma, *Wercklé 120*. Known only from the type collection.

### KEGELIELLA Mansfeld.

A small, insufficiently known genus with one species in Costa Rica and another in Surinam and Trinidad.

**Kegeliella Kupperi** Mansfeld, Repert. Sp. Nov. 36: 60. 1934. Guanacaste, Tilarán, *Kupper 851*. Known only from the type collection.

### LACAENA Lindl.

Sepals and petals white with purple stripes; racemes loosely flowered, drooping. One other species in Guatemala.

**Lacaena spectabilis** (Klotzsch) Reichenb. f. Bonplandia 2: 92. 1854. *Nauenia spectabilis* Klotzsch, Allgem. Gartenz. 21: 193. 1853. Until recently known only from the type collection and from specimens in gardens; now known to be also a native of Honduras.

### LAELIA Lindl.

A large genus with a single species in Costa Rica. Flower shoot elongated from the apex of a flattened, 1-leaved pseudobulb. Flower purplish or white with a dark maroon spot in the throat of the lip.

**Laelia rubescens** Lindl. Three collections of this species have been examined: San José (from a garden), *Ames II.110;* Orotina, Pacific side, *Alfaro 56;* Guanacaste Province, La Cruz, *Jiménez 6265*. Also in Yucatan, Salvador, Honduras, and Nicaragua.

### LANKESTERELLA Ames

Sched. Orch. 4: 3. 1923. Small herbs with rosettes of succulent leaves and an elongated, hirsute flower shoot bearing three to ten densely glandular flowers.

**Lankesterella costaricensis** Ames, Sched. Orch. 4: 4. 1923. La Estrella, *Lankester & Sancho 387*. *Cladobium costaricense* Schltr. Repert. Sp. Nov. Beih. 19: 87. 1923 (La Carpintera, 1,770 meters, *A. & C. Brade 1187*). Two other specimens from the Province of Cartago, *Standley 34421* and *39248*, are referable to this species. Endemic.

## LEOCHILUS Knowles & Westcott

Small epiphytes with flattened pseudobulbs from the base of which the flower shoot arises. Flowers small, in few-flowered racemes. Kränzlin, Pflanzenr. IV. 50: 291. 1922.

**Leochilus gracilis** Schlechter, Repert. Sp. Nov. Beih. 19: 152. 1923. San Jerónimo de Grecia, 1,150 meters *A. & C. Brade 1321*. A number of collections have been examined. Also in Honduras.

**Leochilus retusus** Schlechter, Repert. Sp. Nov. Beih. 19: 256. 1923. Maderal de San Mateo, 400 meters, *Brenes 229*. Known only from the type collection.

**Leochilus scriptus** (Scheidw.) Reichenb. f. One Costa Rican collection is tentatively referred to this species. Also in Guatemala, Honduras, and Panama.

**Leochilus tricuspidatus** (Reichenb. f.) Kränzlin, Pflanzenr. IV. 50, Heft 80: 297. 1922. *Oncidium tricuspidatum* Reichenb. f. Beitr. Orch. Centr. Amer. 72. 1886 (Cartago, *Wendland 606*). Several collections of this species have been examined. Endemic.

## LEPANTHES Swartz

A large genus of epiphytes with slender stems, usually with finely hispidulous sheaths, bearing a single leaf at the summit, with one or more, often many-flowered racemes; sepals usually united and constituting the most conspicuous part of the flower.

**Lepanthes acoridilabia** Ames & Schweinf. Sched. Orch. 10: 38. 1930. Province of San José, near Finca La Cima, above Los Lotes, north of El Copey, 2,100–2,400 meters, *Standley 42717*. Known only from the type collection.

**Lepanthes Acostaei** Schlechter, Repert. Sp. Nov. Beih. 19: 280. 1923. Vicinity of San Ramón, *Acosta*. Known only from the type collection.

**Lepanthes barbae** Schlechter, Repert. Sp. Nov. Beih. 19: 98. 1923. Barba Volcano, 2,000 meters, *A. & C. Brade 1146*. Known only from the type collection.

**Lepanthes blephariglossa** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 394. 1918. La Carpintera, *C. Brade s. n.* Several collections of this species have been seen. Endemic.

**Lepanthes blepharistes** Reichenb. f. Beitr. Orch. Centr. Amer. 92. 1866. Desengaño, *Wendland*. Several collections of this species have been seen. Endemic.

**Lepanthes Bradei** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 394. 1918. La Carpintera, 1,800 meters, *C. Brade s. n.* Three other collections are referred to this species: Pacayas, *Lankester s. n.;* between Las Nubes and San Isidro de Coronado, *Standley 38881a;* and Cerro de La Carpintera, *Standley 34457.* Endemic.

**Lepanthes Brenesii** Schlechter, Repert. Sp. Nov. Beih. 19: 177. 1923. Near San Ramón, 1,025 meters, *Brenes 179,* and Palmira, 1,800 meters, *Brenes 7.* Two other collections are referred to this species: Agua Caliente, 1,290 meters, *Stork 1443,* and Las Cóncavas, *Lankester* (Oesterr. Biol. Costarica Exped. 1930, *No. 802*). Very close to, if not the same as, *L. turialvae.* Endemic.

**Lepanthes cascajalensis** Ames, Sched. Orch. 4: 27. 1923. Cascajal, *Lankester K.350.* Several collections of this species from the Province of Heredia have been examined. Endemic.

**Lepanthes chameleon** Ames, Sched. Orch. 4: 28. 1923. Near Cartago, *Lankester s. n. L. Sanchoi* Ames, Sched. Orch. 4: 34. 1923 (road to La Estrella, *Lankester & Sancho 441*). Several collections of this species have been seen. Endemic.

**Lepanthes ciliisepala** Schlechter, Repert. Sp. Nov. Beih. 19: 99. 1923. El Tablazo, 1,900 meters, *A. & C. Brade 1219,* and La Carpintera, 1,800 meters, *A. & C. Brade 1218.* A few other collections of this species have been seen. Endemic.

**Lepanthes confusa** Ames & Schweinf. Sched. Orch. 10: 40. 1930. Province of Limón, Hamburg Finca, on Río Reventazón below Cairo, *Standley & Valerio 48709.* Also Province of Guanacaste, Naranjos Agrios, 600–700 meters, *Standley & Valerio 46440a.* Endemic.

**Lepanthes costaricensis** Schlechter, Repert. Sp. Nov. Beih. 19: 22. 1923. La Palma, *Wercklé 130.* Known only from the type collection.

**Lepanthes decipiens** Ames & Schweinf. Sched. Orch. 10: 41. 1930. Province of San José, oak forest near Quebradillas, about 7 km. north of Santa María de Dota, about 1,800 meters, *Standley 43070.* Known only from the type collection.

**Lepanthes eciliata** Schlechter. Two Costa Rican collections are tentatively referred to this species: El Salvaje, *Alfaro 140,* and 3 miles northeast of El Copey, *Stork 1640.* Also in Panama.

**Lepanthes elata** Reichenb. f. Beitr. Orch. Centr. Amer. 90. 1866. Desengaño, *Wendland 874*. A number of collections of this species have been examined. Endemic.

**Lepanthes erinacea** Reichenb. f. Bonplandia 3: 225. 1855. Turrialba, *Oersted s. n.* Also reported from Nicaragua by Schlechter.

**Lepanthes estrellensis** Ames, Sched. Orch. 4: 30. 1923. La Estrella, *Lankester & Sancho 385*. Known only from the type collection.

**Lepanthes exasperata** Ames & Schweinf. Sched. Orch. 8: 36. 1925. Navarro, *Lankester 689*. Three collections without flowers are tentatively referred to this species: *Standley 33748*, *Standley & Valerio 43998*, and *M. Valerio 64*. Endemic.

**Lepanthes eximia** Ames, Sched. Orch. 5: 21. June, 1923. La Estrella, *Lankester & Sancho 437*. *L. abnormis* Schltr. Repert. Sp. Nov. Beih. 19: 21. November, 1923 (San Jerónimo, 1,400 meters, *Wercklé 85*). A few other collections have been seen. Endemic.

**Lepanthes grandiflora** Ames & Schweinf. Sched. Orch. 10: 44. 1930. La Pastura, Irazú, 2,850 meters, *Lankester 1190*. Known only from the type collection.

**Lepanthes guanacastensis** Ames & Schweinf. Sched. Orch. 10: 45. 1930. Province of Guanacaste, Naranjos Agrios, 600–700 meters, *Standley & Valerio 46440*. Known only from the type collection.

**Lepanthes horrida** Reichenb. f. Beitr. Orch. Centr. Amer. 91. 1866. Desengaño, *Wendland*. *L. rostrata* Ames, Sched. Orch. 5: 23. 1923 (Cascajal, 1,650 meters, *Lankester 59*). Fairly common in Heredia and San José provinces. Endemic.

**Lepanthes inaequiloba** Ames & Schweinf. Sched. Orch. 10: 46. 1930. Province of San José, Laguna de La Chonta, northeast of Santa María de Dota, 2,000–2,100 meters *Standley 42304*. A few other collections from San José Province belong to this species. Endemic.

**Lepanthes inornata** Schlechter, Repert. Sp. Nov. Beih. 19: 178. 1923. Alto de La Calera de San Mateo, 850 meters, *Brenes 216*. The following collections belong to this species: La Estrella, *Standley 39184* and *39268*; 3 miles northeast of El Copey, *Stork 1652*. Endemic.

**Lepanthes Jimenezii** Schlechter, Repert. Sp. Nov. Beih. 19: 281. 1923. Without locality, *O. Jiménez s. n.* The following collec-

tions are also referable to this species: *Brenes 1626, 533,* and *(11)306.* Endemic.

**Lepanthes lancifolia** Schlechter, Repert. Sp. Nov. Beih. 19: 281. 1923. Vicinity of San Ramón, *Acosta s. n.* Known only from the type collection.

**Lepanthes latisepala** Ames & Schweinf. Sched. Orch. 10: 48. 1930. Without locality, *Stork s. n.* Known only from the type collection.

**Lepanthes Lindleyana** Oerst. & Reichenb. f. Xen. Orch. 1: 149. 1856. Cartago, *Oersted s.n. L. micrantha* Ames, Sched. Orch. 4: 31. May, 1923 (Cartago, La Murta, 1,650 meters, *Lankester 349*). A common and very variable species. Endemic.

**Lepanthes Lindleyana** Oerst. & Reichenb. f. var. **angustifolia** Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 3: 37. 1934. Oak forest near Quebradillas, north of Santa María de Dota, 1,800 meters, *Standley 43071.* Two other collections are referable to this variety: Locality of the type, *Standley 43083,* and Santa María, *Stork 1699.* Endemic.

**Lepanthes Lindleyana** Oerst. & Reichenb. f. var.. **major** Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 3: 38. 1934. La Carpintera, 1,500 meters, *Lankester 543. L. fimbriata* Ames, Sched. Orch. 3: 11. January, 1923 (Alto de Ochomogo, 1,500 meters, *Tonduz; Herb. Inst. Phys.-Geogr. Costar. 10387*). *L. pubilabia* Schltr. Repert. Sp. Nov. Beih. 19: 282. November, 1923 (vicinity of San Ramón, *Acosta s. n.*). Several other collections are referable to this variety. Endemic.

**Lepanthes microglottis** Schlechter, Repert. Sp. Nov. Beih. 19: 101. 1923. El Tablazo, 1,900 meters, *A. & C. Brade 1158.* Two collections are tentatively referred to this species: El Muñeco, south of Navarro, *Standley 33917,* and La Carpintera, *Stork 2062* (collected by Danielson). Endemic.

**Lepanthes minutilabia** Ames & Schweinf. Sched. Orch. 10: 49. 1930. Province of Heredia, Cerros de Zurquí, northeast of San Isidro, 2,000–2,400 meters, *Standley & Valerio 50388.* Several other collections from the same region have been seen. Endemic.

**Lepanthes ramonensis** Schlechter, Repert. Sp. Nov. Beih. 19: 179. 1923. San Rafael de San Ramón, 1,200 meters, *Brenes 207.* Three other collections are referable to this species: La Palma, 1,250

meters, *Brenes (113)443, 1532;* Piedades near San Ramón, 1,050 meters, *Brenes 11454.* Endemic.

**Lepanthes Standleyi** Ames, Sched. Orch. 9: 44. 1925. Province of San José, Las Nubes, 1,500–1,900 meters, *Standley 38800.* One other collection from the same locality belongs to this species: *Standley 38787.* Endemic.

**Lepanthes subdimidiata** Ames & Schweinf. Sched. Orch. 8: 38. 1925. Pejivalle, 900 meters, *Lankester 839.* One other specimen is tentatively referable to this species: San Pedro de Montes de Oca, 1,200 meters, *Standley 36118.* Endemic.

**Lepanthes tipulifera** Reichenb. f. Beitr. Orch. Centr. Amer. 91. 1866. Desengaño, *Wendland.* Two collections are referred (ex char.) to this species: Province of Alajuela, Viento Fresco, 1,600–1,900 meters, *Standley & Torres 47743* and *47813.*

**Lepanthes tridens** Ames, Sched. Orch. 4: 32. 1923. Road to La Estrella, 1,700 meters, *Lankester & Sancho 432.* One other collection of this species has been seen: Santa Clara de Cartago, *Lankester 499.* Endemic.

**Lepanthes turialvae** Reichenb. f. Bonplandia 3: 225. 1855. Turrialba, *Oersted,* also *Wendland 540. L. Tonduziana* Schltr. Repert. Sp. Nov. Beih. 19: 180. 1923 (San Pedro de San Ramón, 1,075 meters, *Brenes 126*). Numerous collections of this species have been examined; in Guanacaste. Also in Guatemala and Honduras.

**Lepanthes Wendlandii** Reichenb. f. Beitr. Orch. Centr. Amer. 91. 1866. Barba Volcano, *Wendland.* Two collections are referred to this species: Alto del Salvaje, 2,000 meters, *Alfaro 149,* and Cascajal, 1,650 meters, *Lankester 58.* Endemic.

**Lepanthes Wercklei** Schlechter, Repert. Sp. Nov. 10: 396. 1912. *L. apiculifera* Schlechter, Repert. Sp. Nov. Beih. 19: 177. 1923 (moist woods, San Pedro de San Ramón, 1,100 meters, *Brenes 72*). Near Pacugao, 2,000 meters, *Wercklé 16173.* Several other collections are referred to this species.

## LIPARIS L. C. Rich.

Terrestrial herbs with succulent leaves either basal or extending up the stem. Flowers inconspicuous, in slender racemes, usually greenish with the lip sometimes dull purple.

**Liparis elata** Lindl. A few collections (from Costa Rica) of this widely distributed species have been examined.

**Liparis eustachys** Schlechter, Repert. Sp. Nov. Beih. 19: 91. 1923. Carillo, 1,400 meters, *A. & C. Brade 1260*. Also La Palma, 1,450 meters, *A. C. Brade 1259*. Endemic.

**Liparis fratrum** Schlechter, Repert. Sp. Nov. Beih. 19: 92. 1923. La Palma, 1,400 meters, *A. & C. Brade 1132*. Three other collections of this species have been examined: La Palma, *Standley 33025;* La Hondura, *Standley 36610* and *37619*. Endemic.

**Liparis vexillifera** (La Llave & Lex.) Cogn. Two collections from Costa Rica have been examined: Zarcero, 1,950 meters, *Lankester & Jiménez 488*, and San Pedro de San Ramón, *Brenes 170* (determined by Schlechter as *L. Lindeniana*). A widely distributed species, from Mexico to Bolivia and in the West Indies.

**Liparis Wendlandii** Reichenb. f. Beitr. Orch. Centr. Amer. 98. 1866. San José, *Wendland 1103*. One other collection has been seen: Near San José, *Tonduz s. n.* Endemic.

## LOCKHARTIA Hook.

Slender epiphytes, the leaves numerous, imbricating, extending to the apex of the stem, bearing prevailingly yellow flowers in the axils of the upper leaves. Kränzlin, Pflanzenr. IV. 50, Heft 83: 6. 1923.

**Lockhartia amoena** Endres & Reichenb. f. Gard. Chron. 666. 1872. Without locality, *Endres s. n.* A number of collections from Costa Rica have been examined. Also in Panama.

**Lockhartia costaricensis** Schlechter, Repert. Sp. Nov. 3: 81. 1906. Los Palmares, *Pittier* (*Herb. Inst. Phys.-Geogr. Costar. 10592*). One other collection is referred to this species: Without locality, *Endres*. Endemic.

**Lockhartia dipleura** Schlechter, Repert. Sp. Nov. Beih. 19: 69. 1923. San Jerónimo, 1,350 meters, *Wercklé 102*. Known only from the type collection.

**Lockhartia grandibractea** Kränzlin, Pflanzr. IV. 50, Heft 83: 15. 1923. Without locality, *Endres s. n.* One other collection is referred to this species: Borders of woods on the Río Jesús de San Ramón, *Brenes 212*. Endemic.

**Lockhartia hercodonta** Reichenb. f. ex Kränzlin, Pflanzenr. IV. 50, Heft 83: 8. 1923. Without locality, *Endres*. A number of collections of this species have been examined; in Guanacaste. Endemic.

**Lockhartia integra** Ames & Schweinf. Sched. Orch. 10: 108. 1930. Province of Guanacaste, El Silencio, near Tilarán, 750 meters, *Standley & Valerio 44675*. Known only from the type collection.

**Lockhartia lamellosa** Reichenb. f. Kränzlin cites a collection from Costa Rica: Santa María, *Endres 543*. This species is perhaps referable to *L. Oerstedii* Reichenb. f. Also in Mexico.

**Lockhartia micrantha** Reichenb. f. *L. Lankesteri* Ames, Sched. Orch. 5: 36. 1923 (San Carlos, *Lankester 448*). Frequent in Costa Rica; Guanacaste. Also in Nicaragua (fide Kränzlin) and Panama.

**Lockhartia odontochila** Kränzlin, Pflanzenr. IV. 50, Heft 83: 17. 1923. Without locality, *Endres s. n.* Known only from the type collection.

**Lockhartia Oerstedii** Reichenb. f. Bot. Zeit. 10: 767. 1852. Barba Volcano, *Oersted s. n.* Frequent in Costa Rica. Also in Guatemala and Panama.

**Lockhartia Pittieri** Schlechter. One Costa Rican collection of this species has been examined: San Carlos, *Lankester 681*. Also in Panama.

## LYCASTE Lindl.

A large tropical American genus, with conspicuous, angled pseudobulbs and large, plicate leaves, bearing conspicuous, often large, showy flowers on lateral peduncles, sometimes as many as six flowers arising from a single pseudobulb. Flowers waxy, often bicolored, with the sepals green and the petals and lip yellow, as in *L. cruenta*, or the sepals greenish and the petals and lip purplish, as in *L. tricolor*. Frequently the leaves are absent during the flowering period.

**Lycaste Bradeorum** Schlechter, Repert. Sp. Nov. Beih. 19: 138. 1923. Near Guanacaste, *A. & C. Brade 1326*. Known only from the type collection.

**Lycaste brevispatha** Klotzsch ex Reichenb. f., including *L. candida* Lindl., which was not actually described under that name until 1863 (Reichenb. f. in Walp. Ann. 6: 604. 1863). Several collections from Costa Rica are referable to this species. Also in Panama and Brazil.

**Lycaste cruenta** Lindl. One collection of this species from Costa Rica has been examined: La Palma, 1,250 meters, *Brenes 513*. Also in Mexico, Guatemala, and Salvador.

**Lycaste Dowiana** Endres & Reichenb. f. Gard. Chron. n. ser. 2: 194. 1874. Without locality, *Endres*. Three collections are referred to this species: Las Cóncavas, 1,400 meters, *Standley 36011;* Naranjo, *Stork 1858* and *1870*.

**Lycaste leucantha** Klotzsch. This species was cited by Reichenbach as collected in Costa Rica by Warscewicz. It was also collected in Costa Rica by Lankester.

**Lycaste tricolor** Klotzsch. Three Costa Rican collections of this species have been examined: San Pedro de San Ramón, 1,075 meters, *Brenes 600;* Pejivalle, *Lankester 853;* and La Hondura, *Lankester 1002*. Also in Guatemala and Panama.

**Lycaste xytriophora** Reichenb. Reichenbach in the original description states that he received plants from Mons. Carmiol collected in Costa Rica.

## MALAXIS Swartz

Succulent terrestrials with prevailingly greenish flowers in simple, many-flowered racemes or in subumbellate racemes, the lip prevailingly the uppermost member of the corolla.

**Malaxis Adolphii** (Schltr.) Ames, Orch. 7: 158. 1922. *Microstylis Adolphi* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 380. 1918 (Alto de La Cruz, *Tonduz s. n.*). Known only from the type collection.

**Malaxis aurea** Ames, Sched. Orch. 5: 3. 1923. Las Cóncavas, *Lankester 346*. Also in Honduras.

**Malaxis blephariglottis** (Schltr.) Ames, Proc. Biol. Soc. Wash. 35: 84. 1922. *Microstylis blephariglottis* Schltr. Repert. Sp. Nov. 12: 202. 1913 (without locality, *Brade*). One other collection from Costa Rica is cited by Schlechter: *A. & C. Brade 1031;* and three collections have been examined: *Brenes (27)322*, *(127)457*, and *Standley & Valerio 51559*. Also in Panama.

**Malaxis brachyrrhynchos** (Reichenb. f.) Ames. *M. Lankesteri* Ames, Sched. Orch. 4: 7. 1923 (Las Cóncavas, *Lankester 350*). Two other collections from Costa Rica are referred to this species: Vicinity of La Esmeralda, *Pittier 4320*, and along San Cristóbal Road, *Stork 2539*. Also in Mexico, Guatemala, and Honduras.

**Malaxis calycina** (Lindl.) Kuntze. *Microstylis microtoides* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 381. 1918 (without locality, *Tonduz s. n.*). Schlechter refers one other Costa Rican collection

to the species: West slope of Irazú Volcano, 1,400 meters, *A. & C. Brade 1068*. Also in Mexico and Guatemala.

**Malaxis carpinterae** (Schltr.) Ames, Orch. 7: 157. 1922. *Microstylis carpinterae* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 381. 1918 (forests of La Carpintera, *Pittier & Tonduz; Herb. Inst. Phys.-Geogr. Costar. 4394*). Known only from the type collection.

**Malaxis crispifolia** (Reichenb. f.) Kuntze, Rev. Gen. Pl. 2: 673. 1891. *Microstylis crispifolia* Reichenb. f. Beitr. Orch. Centr. Amer. 100. 1866 (Desengaño, *Wendland 820*). One other collection of this species has been examined: Las Nubes, 1,500–1,900 meters, *Standley 38681*. Endemic.

**Malaxis hastilabia** (Reichenb. f.) Kuntze, Rev. Gen. Pl. 2: 673. 1891. *Microstylis hastilabia* Reichenb. f. Beitr. Orch. Centr. Amer. 101. 1866 (Barba Volcano, 2,400 meters, *Wendland*). *Malaxis uncinata* Ames & Schweinf. Sched. Orch. 10: 15. 1930 (La Estrella, *Lankester 1034*). Several collections of this species have been seen. Also in South America.

**Malaxis lagotis** (Reichenb. f.) Kuntze, Rev. Gen. Pl. 2: 673. 1891. *Microstylis lagotis* Reichenb. f. Beitr. Orch. Centr. Amer. 101. 1866 (Barba Volcano, 2,700 meters, *Wendland 1050*). Known only from the type collection.

**Malaxis macrostachya** (La Llave & Lex.) Kuntze. Reichenbach cites this species from Costa Rica (Barba Volcano, *Wendland*). Two collections of this species from Costa Rica have been examined: La Palma, *Brenes (86)416*, and near Quebradillas, about 7 km. north of Santa María de Dota, *Standley 43077*. Also in Mexico and Panama.

**Malaxis pandurata** (Schltr.) Ames, Proc. Biol. Soc. Wash. 35: 84. 1922. *Microstylis pandurata* Schltr. Repert. Sp. Nov. 3: 77. 1906 (near La Palma, 1,450 meters, *Tonduz; Herb. Inst. Phys.-Geogr. Costar. 12508*). Two other collections (in fruit) are tentatively referred to this species: La Hondura, *Standley 37842*, and vicinity of Pejivalle, *Standley & Valerio 46931*. Endemic.

**Malaxis Parthonii** Morren. *Microstylis Brenesii* Schltr. Repert. Sp. Nov. Beih. 19: 167. 1923 (San Pedro de San Ramón, 1,150 meters, *Brenes 73*). Several Costa Rican collections are referred to this species. Also in Mexico, Guatemala, Salvador, Honduras, and South America.

**Malaxis Parthonii** Morr. var. **denticulata** (Reichenb. f.) Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 3: 40. 1934. *Microstylis Parthoni* Reichenb. f. var. *denticulata* Reichenb. f. Beitr. Orch. Centr. Amer. 100. 1866 (Aserrí, *Wendland*). *Microstylis Wercklei* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 382. 1918 (without locality, *Wercklé s. n.*). *Malaxis Wercklei* Ames, Proc. Biol. Soc. Wash. 35: 85. 1922. One other collection is referred to this variety: El Silencio, 550 meters, *Brenes (26)321*. Also Panama.

**Malaxis simillima** (Reichenb. f.) Kuntze, Rev. Gen. Pl. 2: 673. 1891. *Microstylis simillima* Reichenb. f. Beitr. Orch. Centr. Amer. 101. 1866 (Desengaño, *Wendland 975*). Three other collections of this species have been examined: Along cart road from Vara Blanca (between Poás and Barba volcanoes) to La Concordia, *Maxon & Harvey 8461;* near Orosi, *Standley 39759;* and Cerro de Las Caricias, north of San Isidro, *Standley & Valerio 52025*. Endemic.

**Malaxis Tonduzii** (Schltr.) Ames, Proc. Biol. Soc. Wash. 35: 85. 1922. *Microstylis Tonduzii* Schltr. Repert. Sp. Nov. 3: 106. 1906 (woods of Barba Volcano, *Tonduz; Herb. Inst. Phys.-Geogr. Costar. 1946*). Known only from the type collection.

## MASDEVALLIA Ruiz & Pavón

Epiphytic herbs with the short stems densely clustered, unifoliate at the summit, with the prevailingly triangular flowers borne on abbreviated or elongated scapes, the sepals united at the base into a cup and often prolonged at the apex into slender, tail-like appendages. Woolward, Monogr. Masdev.; Kränzlin, Repert. Sp. Nov. Beih. 34. 1925.

**Masdevallia anaristella** Kränzlin, Repert. Sp. Nov. 17: 417. 1921. Without locality, *Endres s. n.* Known only from the type collection. Probably referable to *Pleurothallis*.

**Masdevallia anura** Kränzlin, Repert. Sp. Nov. 17: 433. 1921. Without locality, *Endres 21*. Known only from the type collection.

**Masdevallia attenuata** Reichenb. f. Gard. Chron. 834. 1871. *Hort. Veitch.* One other collection from Costa Rica has been seen: Valle de Agua Buena (Cañas Gordas), *Pittier (Herb. Inst. Phys.-Geogr. Costar. 11144)*. Very similar to *M. guianensis* Lindl. and referred to it by Kränzlin. Also in Panama.

**Masdevallia calura** Reichenb. f. Gard. Chron. n. ser., 20: 230. 1883. *Hort. Sander.* One collection has been referred to this species: Cartago, 1,800–2,100 meters, *Lankester 374*. Endemic.

**Masdevallia carpophora** Kränzlin, Repert. Sp. Nov. 17: 427. 1921. Candelaria, Río Parrita, *Endres s. n.* Known only from the type collection.

**Masdevallia cryptocopis** Reichenb. f. ex Kränzlin, Repert. Sp. Nov. Beih. 34: 182. 1925. Without locality, 3,000 meters, *Kalbreyer 602*. Known only from the type collection.

**Masdevallia cupularis** Reichenb. f. Beitr. Orch. Centr. Amer. 93. 1866. Desengaño, *Wendland*. Known only from the type collection and a horticultural specimen.

**Masdevallia demissa** Reichenb. f. Gard. Chron. III. 2: 9. 1887. *Hort. Shuttleworth & Carder*. Known only from the type collection and a horticultural specimen.

**Masdevallia demissa** Reichenb. f. var. **superflua** Kränzlin, Repert. Sp. Nov. Beih. 34: 80. 1925. *M. superflua* Kränzl. Repert. Sp. Nov. 17: 414. 1921 (without locality, *Endres s. n.*). Known only from the type collection.

**Masdevallia diantha** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 384. 1918. Cerro de San Isidro, near San Ramón, 1,300 meters, *Brenes* (*Herb. Inst. Phys.-Geogr. Costar. 14290*), also La Palma, *Wercklé* (*Herb. O. Jiménez 673* and *843*). Common; also in Guanacaste. Endemic.

**Masdevallia ecaudata** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 384. 1918. Vicinity of San José, 1,135 meters, *Biolley 3127*, also La Palma, *Wercklé s. n.* Rather common. Endemic.

**Masdevallia erinacea** Reichenb. f. Reported from Costa Rica by Kränzlin (*Endres 64*). Also in Colombia and Ecuador.

**Masdevallia erythrochaete** Reichenb. f. Gard. Chron. n. ser. 18: 392. 1882. *Hort. Sander*. *M. Gaskelliana* Reichenb. f. Gard. Chron. n. ser., 20: 294. 1883 (*Hort. Sander*). *M. astuta* Reichenb. f. Gard. Chron. n. ser. 26: 584. 1886 (*Carder s. n.*). Several collections have been seen. Endemic.

**Masdevallia exigua** Ames & Schweinf. Sched. Orch. 10: 17. 1930. Bosque de Aguilio en La Palma, 1,190 meters, *Brenes (75)405*. Known only from the type collection.

**Masdevallia fimbriata** Ames & Schweinf. Sched. Orch. 10: 18. 1930. "52 Miles" (the new forest opened up across the Reventazón River by the bridge built at the mile-post on the F.C.C.R.), 270–500 meters, *Lankester 1176*. Known only from the type collection.

**Masdevallia flaveola** Reichenb. f. Gard. Chron. n. ser. 21: 638. 1884. *Hübsch* (Hort. Sander). Two collections from Cachí (*Lankester 1058* and *Lankester & Sancho 377*) have been referred to this species.

**Masdevallia floribunda** Lindl. Two collections from Agua Caliente, 1,800 meters, *Lehmann 1076* and (?)*1072* are referred to this species by Kränzlin. Also in Mexico and Guatemala.

**Masdevallia gorgo** Reichenb. f. ex Kränzlin, Repert. Sp. Nov. Beih. 34: 136. 1925. Cartago near San Ramón, *Endres 134*. Known only from the type collection, if we except a specimen from Navarro, *Lankester 1358*, collected in 1935 and referred to *M. gorgo*.

**Masdevallia lata** Reichenb. f. Gard. Chron. n. ser. 7: 653. 1877. *Zahn* (Costa Rica fide sheet in Herb. Reichenbach). Known only from the type collection.

**Masdevallia Laucheana** Kränzlin. A collection from Costa Rica has been referred to this species: Cachí, *Lankester 1060*. Country of origin unknown.

**Masdevallia Livingstoneana** Reichenb. f. One collection from Costa Rica has been referred to this species: Forests of Boruca, *Pittier 4644*. Also in Panama.

**Masdevallia marginella** Reichenb. f. Gard. Chron. n. ser. 20: 38. 1883. *Hort. Sander*. *M. costaricensis* Rolfe, Gard. Chron. III. 8: 183. 1890 (*Hort. Sander*). Known only from the type collections.

**Masdevallia molossoides** Kränzlin, Repert. Sp. Nov. 17: 416. 1921. Without locality, 1,200 meters, *Endres s. n.* Known only from the type collection.

**Masdevallia nidifica** Reichenb. f. *M. cyathogastra* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 383. 1918 (La Palma, 1,500 meters, *Wercklé; Herb. Jiménez 842*). *M. tenuicauda* Schltr. Repert. Sp. Nov. Beih. 19: 15. 1923 (La Palma, *Wercklé 80*). A number of collections of this species have been examined. Also from Colombia, Ecuador, and Peru.

**Masdevallia odontochila** Schlechter, Repert. Sp. Nov. 9: 29. 1910 (woods, Rancho Flores, 2,043 meters, *Pittier 2011*). *M. reflexa* Schltr. Repert. Sp. Nov. Beih. 19: 276. 1923 (woods, Rancho Flores, 2,000 meters, *Pittier 2011*). Two collections are referred to this species: *Standley & Torres 47732*, and *Valerio 10*. Endemic.

**Masdevallia picturata** Reichenb. f. A number of Costa Rican collections have been examined. Also in Colombia and Venezuela.

**Masdevallia pygmaea** Kränzlin, Repert. Sp. Nov. Beih. 34: 92. 1925. Without locality, *Endres 289*. Known only from the type collection.

**Masdevallia Reichenbachiana** Endres ex Reichenb. f. Gard. Chron. n. ser. 4: 257. 1875. Without locality, *Endres s. n.* Several collections of this species have been seen. Endemic.

**Masdevallia Reichenbachiana** Endres ex Reichenb. f. var. **funebris** (Endres ex Kränzl.) Kränzlin, Repert. Sp. Nov. Beih. 34: 83. 1925. *M. funebris* Endres ex Kränzlin, Repert. Sp. Nov. 17: 435. 1921 (without locality, *Endres 501*). Known only from the type collection.

**Masdevallia rhopalura** Schlechter, Repert. Sp. Nov. Beih. 19: 14. 1923. La Palma, 2,500 meters, *Wercklé 76*, also *Wercklé* (*Herb. O. Jiménez 677*), and San Jerónimo, *Wercklé 18*. Three other collections have been seen: *Brenes 47*, *Standley 36527*, and *Standley 37934*. Endemic.

**Masdevallia Rolfeana** Kränzlin, Gard. Chron. III. 9: 488. 1891. *Hort. Sander*. A number of collections of this species have been examined. Endemic.

**Masdevallia simula** Reichenb. f. Found in San José Province and also in Guanacaste. Guatemala and Colombia.

**Masdevallia Tonduzii** Woolward, Bull. Herb. Boiss. II. 6: 82. 1906. Without locality, *Tonduz* in Hort. Chambesiensis. Several collections from the Province of Cartago have been examined. Endemic.

**Masdevallia triaristella** Reichenb. f. Gard. Chron. n. ser. 6: 226. 1876. Without locality, *Endres s. n.* Several collections of this species have been seen. Also in Colombia.

**Masdevallia trichaete** Reichenb. f. Gard. Chron. n. ser. 20: 360. 1883. *Hort. Wallace*, probably from Costa Rica fide Kränzlin. Known only from the type collection.

**Masdevallia tridactylites** Reichenb. f. Gard. Chron. n. ser. 19: 784. 1883. Near San Ramón, *Endres 260* (fide Kränzlin). Known only from the type collection.

**Masdevallia triseta** Reichenb. f. ex Kränzlin, Repert. Sp. Nov. Beih. 34: 201. 1925. *Endres s. n.* Known only from the type collection.

**Masdevallia tubuliflora** Ames. One collection of this species from Costa Rica has been examined: Peralta, *Lankester 1122*. Also in Guatemala and British Honduras.

**Masdevallia Zahlbruckneri** Kränzlin, Repert. Sp. Nov. 17: 413. 1921. Without locality, *Endres s. n.* Known only from the type collection.

## MAXILLARIA Ruiz & Pavón

A large, polymorphic genus, widely distributed in tropical America, usually pseudobulbous with small or sometimes conspicuous flowers.

**Maxillaria acervata** Reichenb. f. Bonplandia 3: 217. 1855. Suruguas, *Oersted*. The following collections from Costa Rica have been referred to this species: Naranjo, *Wendland 397;* near San Ramón, *Brenes 180;* and without locality, *Jiménez s. n.* Endemic.

**Maxillaria aciantha** Reichenb. f. Bot. Zeit. 10: 858. 1852. Without locality, *Warscewicz s. n.* The following collections from Costa Rica have been referred to this species: Cartago and Agua Caliente, *Oersted;* without locality, *A. & C. Brade 1251;* and near San Ramón, *Brenes 180*. Also in Mexico(?) and Guatemala. This species merges with *M. Friedrichsthalii* Reichenb. f.

**Maxillaria Acostaei** Schlechter, Repert. Sp. Nov. Beih. 19: 301. 1923. Vicinity of San Ramón, *Acosta s. n.* Known only from the type collection.

**Maxillaria alba** Lindl. One Costa Rican collèction is referred to the species: Naranjo, *Estrella Umaña 33*. Extending to South America.

**Maxillaria Albertii** Schlechter, Repert. Sp. Nov. Beih. 19: 230. 1923. On Río Jesús de San Ramón, 800 meters, *Brenes 257*. Known only from the type collection.

**Maxillaria Alfaroi** Ames & Schweinf. Sched. Orch. 10: 83. 1930. Carretera Fuentes, *Alfaro 284*. Known only from the type collection.

**Maxillaria anceps** Ames & Schweinf. Sched. Orch. 10: 84. 1930. Bosque Aguileo en La Palma, 1,190 meters, *Brenes (133)463*. Also in Guatemala.

**Maxillaria angustisegmenta** Ames & Schweinf. Sched. Orch. 10: 86. 1930. Bosque de Aguileo en La Palma, 1,190 meters, *Brenes (132)462*. One other collection is referable to this species: Vicinity of Pejivalle, *Standley & Valerio 47197*. Endemic.

**Maxillaria angustissima** Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 3: 41. 1934. *M. acutifolia* Schltr. Repert. Sp. Nov. Beih. 19: 229. 1923, non Lindl. (Distrito Volís de San Ramón, 1,250 meters, *Brenes 235*). Schlechter refers one other collection to this species: Los Angeles de San Ramón, *Brenes 159*. A third collection is probably referable to the species: La Palma, *Brenes (173)504*. Endemic.

**Maxillaria appendiculoides** C. Schweinf. Bot. Mus. Leafl. Harv. Univ. 4: 119. 1937. Collines de San Pedro de San Ramón, 1,100 meters, *Brenes 1427*. Also referable to the species is *Brenes 1378*, from a cultivated plant.

**Maxillaria arachnitiflora** Ames & Schweinf. Sched. Orch. 10: 87. 1930. Navarro, 1,200 meters, *Lankester 1212*. Known only from the type collection.

**Maxillaria atrata** Reichenb. f. var. **brachyantha** Reichenb. f. Beitr. Orch. Centr. Amer. 78. 1866. Below Desengaño, 1,800 meters, *Wendland*. Known only from the type collection.

**Maxillaria attenuata** Ames & Schweinf. Sched. Orch. 10: 89. 1930. La Palma, 1,250 meters, *Brenes 512*. Also at Los Angeles de San Ramón, 1,050 meters, *Brenes 1405*. Endemic.

**Maxillaria brachybulbon** Schlechter, Repert. Sp. Nov. Beih. 19: 55. 1923. San Jerónimo, *Wercklé 23*. Four other collections are referred to this species: San Pedro de San Ramón, *Brenes 134;* vicinity of Guápiles, *Standley 37412;* and vicinity of Pejivalle, *Standley & Valerio 47050* and *47234*.

**Maxillaria Brenesii** Schlechter, Repert. Sp. Nov. Beih. 19: 231. 1923. San Pedro de San Ramón, 1,050–1,250 meters, *Brenes 78*. *M. lactea* Schlechter, Repert. Sp. Nov. Beih. 19: 233. 1923 (Maderal de San Mateo, 500 meters, *Brenes 143*). Frequent; also in Guanacaste. Venezuela.

**Maxillaria Brenesii** Schltr. var. **longiloba** Ames & Schweinf. Sched. Orch. 10: 90. 1930. Yerba Buena, northeast of San Isidro, 2,000 meters, *Standley & Valerio 49104*. Several collections of this variety have been examined. Endemic.

**Maxillaria brevipes** Schlechter, Repert. Sp. Nov. Beih. 19: 302. 1923. Near La Palma, *Wercklé 110*. Known only from the type collection.

**Maxillaria caespitifica** Reichenb. f. Linnaea 41: 73. 1876. Without locality, *Endres s. n.* Known only from the type collection.

**Maxillaria chartacifolia** Ames & Schweinf. Sched. Orch. 10: 92. 1930. Province of Guanacaste, La Tejona, north of Tilarán, 600–700 meters, *Standley & Valerio 45989*. Two other collections from the same locality are referable to this species: *Standley & Valerio 46002* and *46018*. Endemic.

**Maxillaria confusa** Ames & Schweinf. Sched. Orch. 8: 57. 1925. Peralta, *Lankester 908*. Three other collections have been examined: La Fuente, *Alfaro 175;* San Pedro de San Ramón, 1,100 meters, *Brenes 1236;* Piedades near San Ramón, *Brenes 1250*. Endemic.

**Maxillaria crassifolia** (Lindl.) Reichenb. f. Several Costa Rican collections of this species have been examined. Also in Guatemala, Panama, Venezuela, and West Indies.

**Maxillaria ctenostachys** Reichenb. f. Gard. Chron. 39. 1870. Without locality, *Hort. Veitch. Camaridium ctenostachys* Schltr. Repert. Sp. Nov. Beih. 19: 238. 1923. Two other collections are referred to this species: Sabanillas de Acosta, 1,050 meters, *Lankester 1228*, and "La Calera" de San Mateo, *Brenes 96*. Endemic.

**Maxillaria cucullata** Lindl. A number of collections of this species from Costa Rica have been examined. Also in Guatemala, Nicaragua, and South America.

**Maxillaria diuturna** Ames & Schweinf. Several Costa Rican collections are referable to this species; in Guanacaste. Panama.

**Maxillaria elatior** Reichenb. f. Several collections from Costa Rica are referred to this species; in Guanacaste. Mexico and Guatemala.

**Maxillaria Endresii** Reichenb. f. Gard. Chron. n. ser. 25: 680. 1886. Without locality, *Endres s. n.* Three other collections of this species have been examined: Estrella Valley, *Alfaro 239;* vicinity of Guápiles, *Standley 37221* and *37449*.

**Maxillaria flava** Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 3: 41. 1934. *Ornithidium ramonense* Schltr. Repert. Sp. Nov. Beih. 19: 243. 1923 (San Pedro de San Ramón, 1,050–1,200 meters, *Brenes 137*, non *Maxillaria ramonensis* Schltr.). Two other collections are referable to this species: *Brenes (154)485;* La Fuente, *Alfaro s. n.* Endemic.

**Maxillaria foliosa** Ames & Schweinf. Sched. Orch. 8: 60. 1925. Peralta, La Unión, 900 meters, *Lankester 478*. Several collections are referable to this species. Endemic.

**Maxillaria Friedrichsthalii** Reichenb. f. *M. turialbae* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 414. 1918 (Turrialba Valley, *Lehmann 1098*). Frequent in Costa Rica; Guanacaste. Guatemala and Panama.

**Maxillaria Houtteana** Reichenb. f. Several Costa Rican collections of this species have been examined. Also in Guatemala.

**Maxillaria inaudita** Reichenb. f. Beitr. Orch. Centr. Amer. 76. 1866. Cartago, near Naranjo, *Wendland*. Several collections referable to this species have been examined; Guanacaste. Endemic.

**Maxillaria inaudita** Reichenb. f. var. **minor** Ames & Schweinf. Sched. Orch. 10: 94. 1930. La Fuente, 1,200 meters, *Alfaro 241*. Known only from the type collection.

**Maxillaria Lankesteri** Ames, Sched. Orch. 7: 11. 1924. Cachí, *Lankester 508*. *Ornithidium aurantiacum* Schltr. Repert. Sp. Nov. Beih. 19: 241. 1923, non *Maxillaria aurantiaca* Schltr. (San Pedro de San Ramón, 1,100 meters, *Brenes 129*). One other collection is referable to this species: La Estrella, *Lankester 429*. Endemic.

**Maxillaria linearifolia** Ames & Schweinf. Sched. Orch. 10: 95. 1930. El Silencio de San Ramón, 1,000 meters, *Brenes (19)314*. Two other collections are referred to this species: Navarrito–Cartago, *Torres 174*, and El Muñeco, *Stork 1465*. Endemic.

**Maxillaria maleolens** Schlechter, Repert. Sp. Nov. Beih. 19: 233. 1923. Río Jesús de San Ramón, 800 meters, *Brenes 281*. The only Costa Rican collection known is the type. Also in Honduras and Panama.

**Maxillaria microphyton** Schlechter, Repert. Sp. Nov. 8: 457. 1910. La Palma, 1,700–2,000 meters, *Tonduz 9670*. *Ornithidium parvulum* Schltr. Repert. Sp. Nov. 9: 292. 1911 (La Palma, 1,700–2,000 meters, *Tonduz 9670*). *Ornithidium pallidiflavum* Schltr. Repert. Sp. Nov. Beih. 19: 242. 1923 (San Pedro de San Ramón, *Brenes 135*). Frequent. Endemic.

**Maxillaria nasuta** Reichenb. f. *M. brevipedunculata* Ames & Schweinf. Sched. Orch. 10: 91. 1930 (Toro Amarillo, 1,600 meters, *Alfaro 190*). One other collection is referred to this species: La Tejona, north of Tilarán, *Standley & Valerio 46058*. Also in Colombia.

**Maxillaria oreocharis** Schlechter. Several collections of this species from Costa Rica have been examined. Also in Panama.

**Maxillaria parvilabia** Ames & Schweinf. Sched. Orch. 8: 62. 1925. La Palma, 1,600 meters, *Standley 32939*. Several other collections have been examined. Endemic.

**Maxillaria piestopus** Schlechter, Repert. Sp. Nov. Beih. 19: 302. 1923. San Ramón, *Tonduz s. n.* One other collection is referred (ex char.) to this species: Orosi, *Lankester 1213*. Endemic.

**Maxillaria ramonensis** Schlechter, Repert. Sp. Nov. Beih. 19: 235. 1923. Santiago de San Ramón, 1,050 meters, *Brenes 154*. Three other collections of this species are known: Vicinity of San Ramón, *Acosta;* La Palma de San Ramón, *Brenes (82)412;* and El Silencio, near Tilarán, *Standley & Valerio 44673*. Endemic.

**Maxillaria Reichenheimiana** Reichenb. f. Gard. Chron. 1678. 1871. *M. pachyacron* Schlechter, Repert. Sp. Nov. 9: 165. 1911 (La Palma, 1,700–2,000 meters, *Tonduz 9681*). Without locality, *Endres s. n.* A number of collections have been examined. Endemic.

**Maxillaria ringens** Reichenb. f. *M. Tuerckheimii* Schlechter; *M. Amparoana* Schlechter, Repert. Sp. Nov. Beih. 19: 54. 1923 (Carillo, *Wercklé 7*). Several Costa Rican specimens have been examined. Ranging from Mexico to Panama.

**Maxillaria rubrilabia** Schlechter, Repert. Sp. Nov. Beih. 19: 236. 1923. Santiago de San Ramón, 1,050 meters, *Brenes 151*. Known only from the type collection.

**Maxillaria rufescens** Lindl. Frequent in Costa Rica, especially in Guanacaste. Also in Guatemala, South America, and West Indies.

**Maxillaria sanguinea** Rolfe. A number of collections of this species from Costa Rica have been examined; frequent in Guanacaste. Original habitat Panama.

**Maxillaria schistostele** Schlechter, Repert. Sp. Nov. Beih. 19: 303. 1923. Vicinity of San Ramón, *Acosta*. Known only from the type collection.

**Maxillaria semiorbicularis** Ames & Schweinf. Sched. Orch. 8: 64. 1925. La Hondura, 1,300–1,700 meters, *Standley 36247*. Known only from the type collection.

**Maxillaria tenuifolia** Lindl. Cited by Reichenbach f. as occurring in Costa Rica: Aguacate, *Oersted*. Also in Mexico, British Honduras, and Guatemala.

**Maxillaria uncata** Lindl., including *M. Macleei* Bateman ex Lindley. *M. stenostele* Schltr. Beih. Bot. Centralbl. 36, Abt. 2:

414. 1918 (Río Sucio, *Lehmann 1236*). Frequent in Costa Rica; Guanacaste. British Honduras, Guatemala, Panama, and South America.

**Maxillaria vagans** Ames & Schweinf. A number of collections of this species from Costa Rica have been examined. Also in Panama.

**Maxillaria vaginalis** Reichenb. f. Beitr. Orch. Centr. Amer. 77. 1866. *Camaridium Wercklei* Schlechter, Repert. Sp. Nov. Beih. 19: 58. 1923 (San Cristóbal, *Wercklé 5*). Desengaño, *Wendland.* Also La Palma, 1,750 meters, *Wercklé* (*Herb. O. Jiménez 686*). Endemic.

**Maxillaria valenzuelana** (A. Rich.) Nash. Schlechter cites this species from Costa Rica: Turrialba, *A. & C. Brade 1170,* and several collections have been examined which seem referable to it. Also in the West Indies.

**Maxillaria Valerioi** Ames & Schweinf. Sched. Orch. 10: 96. 1930. Vicinity of Pejivalle, 900 meters, *Standley & Valerio 46940.* Known only from the type collection.

**Maxillaria variabilis** Bateman ex Lindley. *M. costaricensis* Schltr. Repert. Sp. Nov. Beih. 19: 232. 1923 (Distrito Volís de San Ramón, 1,050 meters, *Brenes 236*). Common in Costa Rica; frequent in Guanacaste. Ranging from Mexico to Panama and occurring in British Guiana.

## MESOSPINIDIUM Reichenb. f.

A small genus of small-flowered plants related to *Brassia* and *Oncidium.*

**Mesospinidium leochilinum** (Reichenb. f.) Schlechter, Repert. Sp. Nov. Beih. 19: 253. 1923. *Rodriguezia leochilina* Reichenb. f. Gard. Chron. 970. 1871 (without locality, *Hort. Veitch*). Four collections are referred to this species: San Pedro de San Ramón, *Brenes 193;* vicinity of San Ramón, *Acosta;* La Palma, *Wercklé 121;* and Los Ayotes, near Tilarán, *Standley & Valerio 45438.* Endemic.

**Mesospinidium Warscewiczii** Reichenb. f. *Solenidium Endresii* Kränzl. Pflanzenr. IV. 50, Heft 80: 317. 1922 (without locality, *Endres*). Reported from Costa Rica by Schlechter.

## MILTONIA Lindl.

Epiphytes with large, showy flowers, those of *M. Endresii* being white with dark purple spots at the base of the sepals, petals, and lip.

**Miltonia Endresii** Nicholson. Several collections of this species from Costa Rica have been examined. Also in Panama.

**Miltonia Schroederiana** (Reichenb. f.) O'Brien. Three collections from Costa Rica are referred to this species: Carillo region, *Lankester 511;* La Hondura, *Lankester 1151;* and San Pedro de San Ramón, *Brenes (16)311.* Also in Mexico.

**Miltonia stenoglossa** Schlechter, Repert. Sp. Nov. Beih. 19: 66. 1923. Garden of Mme. Amparo de Zeledón, *Tonduz 31.* Three other collections are referable to this species: La Carpintera and Santa María, *Lankester 1132;* San Cristóbal, *Lankester s. n.;* and La Carpintera, *Stork 2335* (collected by Danielson). Endemic.

## MORMODES Lindl.

A small genus closely allied to *Catasetum,* in part distinguished from it by the twisted column.

**Mormodes atropurpureum** Lindl. Three collections of this species from Costa Rica have been examined: Pirrís, *Lankester 1199;* Peralta, Las Lajas, *Lankester 573;* and vicinity of Santa María de Dota, *Standley & Valerio 43705.* Also in Panama.

**Mormodes buccinator** Lindl. Reported from Costa Rica by Schlechter. Also in Nicaragua and South America.

**Mormodes colossus** Reichenb. f. Several collections of this species from Costa Rica are known.

**Mormodes fractiflexum** Reichenb. f. Gard. Chron. 141. 1872. *Hort. Veitch,* also *Endres s. n.* Otherwise unknown.

**Mormodes Hookeri** Lemaire. One collection of this species from Costa Rica has been examined: San Carlos, *Lankester 795.* Also in Panama.

**Mormodes lobulatum** Schlechter, Repert. Sp. Nov. 8: 456. 1910. Near Cañas Gordas, *Pittier 11147.* Known only from the type collection.

**Mormodes stenoglossum** Schlechter, Repert. Sp. Nov. Beih. 19: 225. 1923. Near "La Calera" de San Mateo, 500–600 meters, *Brenes 256.* One other Costa Rican collection probably referable to this species has been seen: Pozo Azul de Pirrís, *Lankester 1200.* Also in Guatemala.

**Mormodes Wendlandii** Reichenb. f. in Walp. Ann. 6: 581. 1863. Naranjo, *Wendland.* Known only from the type collection.

## MORMOLYCE Fenzl

In habit similar to *Maxillaria*, bearing on an elongated, slender scape a single yellow flower which is conspicuously striped with brown.

**Mormolyce ringens** (Lindl.) Schlechter. Two collections of this species from Costa Rica have been examined: Province of Guanacaste, vicinity of Tilarán, 500–650 meters, *Standley & Valerio 44539* and *46574*. Also in British Honduras, Guatemala, and Mexico.

## NOTYLIA Lindl.

Epiphytes with unifoliate, flattened pseudobulbs, bearing numerous small flowers in pendulous or erect racemes, the lateral sepals more or less united.

**Notylia bicolor** Lindl. One collection from Costa Rica is referred to this species: La Palma de San Ramón, *Brenes (66)396*. Also in Guatemala.

**Notylia Lankesteri** Ames, Sched. Orch. 5: 34. 1923. Río Estrella, *Lankester & Sancho 373*. Known only from the type collection.

**Notylia linearis** Ames & Schweinf. Sched. Orch. 8: 72. 1925. La Fuente, East Turrialba, 1,150–1,200 meters, *Alfaro s. n.* Known only from the type collection.

**Notylia paniculata** Ames & Schweinf. Sched. Orch. 10: 102. 1930. Vicinity of Pejivalle, 900 meters, *Standley & Valerio 46858*. Known only from the type collection.

**Notylia Pittieri** Schlechter, Beih. Centralbl. 36, Abt. 2: 418. 1918. Boruca, *Pittier 6850*. Two other Costa Rican collections are referred to this species: Toward Corozal, *Dodge 7894;* Finca Santa María, Osa Peninsula, near Puerto Jiménez, *Cufodontis 155*. Also in Panama.

**Notylia ramonensis** Schlechter, Repert. Sp. Nov. Beih. 19: 250. 1923. Santiago de San Ramón, 950 meters, *Brenes 91*. Known only from the type collection.

**Notylia trisepala** Lindl. & Paxt. *N. turialbae* Schltr. Repert. Sp. Nov. Beih. 19: 145. 1923 (Turrialba, *A. & C. Brade 1186*). *N. Brenesii* Schltr. Repert. Sp. Nov. Beih. 19: 249. 1923 (San Pedro de San Ramón, *Brenes 173*). Three other collections from Costa

Rica are referred to this species: Monte Verde, *Stork 1694;* San Carlos, *Jiménez & Lankester 2004;* Las Cóncavas, *Lankester 1085.* Also in Mexico, British Honduras, Guatemala, Honduras, Nicaragua, and Panama.

## OCTOMERIA R. Br.

Epiphytes similar to *Pleurothallis* in habit, distinguished by having eight pollen masses.

**Octomeria costaricensis** Schlechter, Repert. Sp. Nov. Beih. 19: 111. 1923. Atlantic Coast, Finca Gebr. Hundrisser, *A. & C. Brade 1217.* Also probably in Panama.

**Octomeria Valerioi** Ames & Schweinf. Sched. Orch. 10: 51. 1930. Province of Guanacaste, El Silencio, near Tilarán, 750 meters, *Standley & Valerio 44769.* Two other collections from the same locality are probably referable to this species: *Standley & Valerio 44788* and *44817.* Endemic.

## ODONTOGLOSSUM HBK.

Epiphytes with compressed pseudobulbs bearing axillary racemes of showy flowers in which the column is parallel with the base of the lip.

**Odontoglossum cariniferum** Reichenb. f. Several collections from Costa Rica are referred to this species. Also in Panama.

**Odontoglossum chiriquense** Reichenb. f. Schlechter cites this species from Costa Rica: La Palma, 1,400 meters, *A. & C. Brade 1147.* Also in Panama.

**Odontoglossum Krameri** Reichenb. f. Gard. Chron. 98. 1868. Without locality, *Hort. Veitch.* Two collections are known: Hort. Doña Amparo de Zeledón, *Tonduz 1920;* San Pedro de San Ramón, *Brenes 282.* There is also a white form represented by one collection: Peralta, 750 meters, *Lankester 456.* Endemic.

**Odontoglossum maculatum** La Llave & Lex. Schlechter cites one collection from Costa Rica: Candelaria Mountains, 1,800 meters, *A. & C. Brade 1195.*

**Odontoglossum Oerstedii** Reichenb. f. Bonplandia 3: 214. 1855. Volcán de Irazú, 2,700 meters, *Warscewicz.* Rather frequent. Endemic.

**Odontoglossum Schlieperianum** Reichenb. f. Gard. Chron. 1082. 1865. Without locality or collector. Several collections of this species have been examined. Probably endemic.

**Odontoglossum Williamsianum** Reichenb. f. Warner and Williams record this species as coming from Costa Rica. Probably a natural hybrid. Also Honduras, and recorded as occurring in Guatemala.

## ONCIDIUM Swartz

Epiphytes with compressed pseudobulbs bearing axillary racemes or panicles of prevailingly small, yellowish and brown flowers with the column diverging from the base of the lip. This genus is difficult to distinguish in some of the species from *Odontoglossum* and *Miltonia*. Kränzlin, Pflanzenr. IV. 50, Heft 80: 87. 1922.

**Oncidium advena** Reichenb. f. This species is recorded from Costa Rica by Kränzlin: Without locality, *Hübsch.* Also in Panama and Venezuela.

**Oncidium ampliatum** Lindl. Several collections from Costa Rica have been examined. Also in Guatemala, Nicaragua, Panama, West Indies, and South America.

**Oncidium angustisepalum** Kränzlin, Pflanzenr. IV. 50, Heft 80: 203. 1922. Without locality, *Endres.* Known only from the type collection.

**Oncidium ascendens** Lindl. Rather common in Costa Rica; Guanacaste. Mexico, British Honduras, Guatemala, and Nicaragua.

**Oncidium asparagoides** Kränzlin, Pflanzenr. IV. 50, Heft 80: 175. 1922. Without locality, *Endres 127.* Known only from the type collection.

**Oncidium bracteatum** Warsc. & Reichenb. f. A number of Costa Rican collections of this species have been examined. Also in Panama.

**Oncidium Brenesii** Schlechter, Repert. Sp. Nov. Beih. 19: 257. 1923. San Ramón, 1,025 meters, *Brenes 240.* Known only from the type collection.

**Oncidium bryolophotum** Reichenb. f. *O. megalous* Schlechter, Repert. Sp. Nov. 9: 30. 1910 (forests of Esmeralda, *Biolley 7256*). Rather common in Costa Rica. Also in Panama. It seems possible that the type was collected in Costa Rica by Endres, but the habitat as given by Reichenbach is only Central America.

**Oncidium cabagrae** Schlechter, Repert. Sp. Nov. 9: 292. 1911. Cabagra near Buenos Aires, *Pittier 6589.* Schlechter cites one other

collection of this species: San Pedro de San Ramón, *Brenes 119*. Perhaps also in Panama (Chiriquí).

**Oncidium calyptostalix** Kränzlin, Pflanzenr. IV. 50, Heft 80: 260. 1922. Without locality, *Endres s. n.* Known only from the type collection.

**Oncidium carthaginense** (Jacq.) Swartz. Three Costa Rican collections of this species have been examined: San Carlos, *Lankester 497;* Río Segundo (Alajuela; cult. in Brade Garden), *Jiménez 2038;* and Alajuela, *Alfaro 133*. A widely distributed species, occurring from Yucatan to Venezuela and Colombia and in the West Indies.

**Oncidium carthaginense** (Jacq.) Sw. var. **Oerstedii** (Reichenb. f.) Lindl. Fol. Orch. Oncid. 40. 1855. *O. Oerstedii* Reichenb. f. Bonplandia 2: 91. 1854 (Irazú at San Juan, 2,700 meters, *Oersted*). Schlechter cites one other Costa Rican collection: San Pedro de San Ramón, *Brenes 14*. Also in Nicaragua and Panama.

**Oncidium Cebolleta** (Jacq.) Swartz. Several Costa Rican collections of this species have been examined; Guanacaste. A widely distributed species, occurring from Mexico to Brazil and in the West Indies.

**Oncidium cheirophorum** Reichenb. f. *O. Dielsianum* Kränzlin, Pflanzenr. IV. 50, Heft 80: 197. 1922 (without locality, *Endres s. n.*). Rather common in Costa Rica; Guanacaste. Panama and South America.

**Oncidium chelidonizon,** Kränzlin, Pflanzenr. IV. 50, Heft 80: 217. 1922. San Ramón along the Río Grande, *Endres s. n.* Known only from the type collection.

**Oncidium costaricense** Schlechter, Repert. Sp. Nov. 9: 30. 1910. Forests of Térraba, 2,600 meters, *Pittier 3859*. Known only from the type collection.

**Oncidium crista-galli** Reichenb. f. Three Costa Rican collections of this species are known: La Carpintera, *A. & C. Brade 1109;* San Pedro de San Ramón, *Brenes 242;* and Arenal, *Juvenal Valerio 140*.

**Oncidium dichromaticum** Reichenb. f. Probably from Costa Rica according to Kränzlin, but no material has been seen.

**Oncidium fulgens** Schlechter. *O. varians* Schltr. Repert. Sp. Nov. Beih. 19: 151. 1923 (La Palma, 1,400 meters, *A. & C. Brade*

*1095*). Several collections of this species from Costa Rica have been examined; in Guanacaste. Also in Panama.

**Oncidium globuliferum** HBK. var. **costaricense** Reichenb. f. Gard. Chron. 1678. 1871. Without locality, *Endres s. n.*, also *Zahn s. n. O. Wercklei* Schlechter, Repert. Sp. Nov. Beih. 19: 68. 1923 (San Jerónimo, *Wercklé 46*). Several collections have been examined. Endemic.

**Oncidium glossomystax** Reichenb. f. There is a drawing of an Endres specimen from Costa Rica in the Reichenbachian Herbarium. Also reported from Mexico, Guatemala, Nicaragua, and South America.

**Oncidium guttulatum** Reichenb. f. ex Lindl. Cited by Kränzlin from Costa Rica, *Endres:* and by Schlechter: Cultivated in the garden of Mme. Amparo de Zeledón, *Tonduz 20*, and Cachí, *A. & C. Brade 1130*. Probably endemic.

**Oncidium Henrici-Gustavi** Kränzlin, Pflanzenr. IV. 50, Heft 80: 242. 1922. Without locality, *Endres 292*. Known only from the type collection.

**Oncidium Kramerianum** Reichenb. f. Reported from Costa Rica by Kränzlin: Near Limón, *Pfau*. Also in Panama, Colombia, and Ecuador.

**Oncidium Lankesteri** Ames, Sched. Orch. 4: 53. 1923. Irazú Volcano, slopes in valley of Reventado, *Lankester & Sancho 415*. A number of other collections have been examined. Endemic.

**Oncidium lintriculus** Kränzlin, Pflanzenr. IV. 50, Heft 80: 282. 1922. Without locality, *Endres 168*. Known only from the type collection.

**Oncidium macranthum** Lindl. Schlechter questionably cites this species as occurring in Costa Rica. Also in South America.

**Oncidium macrorhynchum** Kränzlin, Pflanzenr. IV. 50, Heft 80: 200. 1922. San Juan de Candelaria, *Endres s. n.* Known only from the type collection.

**Oncidium microphyton** Kränzlin, Pflanzenr. IV. 50, Heft 80: 204. 1922. Without locality, *Endres s. n.* Known only from the type collection.

**Oncidium naranjense** Schlechter, Repert. Sp. Nov. Beih. 19: 259. 1923. Cerro del Espíritu Santo, Naranjo de Alajuela, 1,075 meters, *Brenes 22*. Known only from the type collection.

**Oncidium obryzatoides** Kränzlin, Pflanzenr. IV. 50, Heft. 80: 240. 1922. Without locality, *Endres*. Several collections are referred to this species. Endemic.

**Oncidium ochmatochilum** Reichenb. f. Several Costa Rican collections of this species have been examined. Also in Panama.

**Oncidium ornithorhynchum** HBK. This species is cited by Kränzlin as occurring in Costa Rica: Without locality, *Endres*. Also in Mexico, Guatemala, Salvador, and Panama.

**Oncidium paleatum** Schlechter, Repert. Sp. Nov. Beih. 19: 260. 1923. San Rafael de San Ramón, 1,250 meters, *Brenes 206*. Known only from the type collection.

**Oncidium panduriforme** Ames & Schweinf. Sched. Orch. 8: 77. 1925. Cachí, *Alfaro s.n.* Known only from the type collection.

**Oncidium Pittieri** Schlechter, Repert. Sp. Nov. 9: 31. 1910. Near La Palma, 1,550 meters, *Pittier 10310*. *O. cheirophoroides* Kränzlin, Pflanzenr. IV. 50, Heft 80: 199. 1922 (without locality, *Endres s. n.*). Several collections are referable to this species. Endemic.

**Oncidium polycladium** Reichenb. f. ex Lindl. Fol. Orch. Oncid. 47. 1855. It is open to question whether the type collection was from Costa Rica or Panama; probably from Panama. Several collections of this species from Costa Rica have been examined. Also in Nicaragua and Panama.

**Oncidium pusillum** (L.) Reichenb. f. Many collections of this widely distributed species have been reported or examined from Costa Rica The species occur from Mexico to Bolivia and in the West Indies.

**Oncidium Rechingerianum** Kränzlin, Pflanzenr. IV. 50, Heft 80: 202. 1922. Without locality, *Endres s. n.* Several collections of this species from Costa Rica have been examined. Also in Panama.

**Oncidium scabripes** Kränzlin, Pflanzenr. IV. 50, Heft 80: 277. 1922. Without locality, *Endres s. n.* Known only from the type collection.

**Oncidium sclerophyllum** Kränzlin, Pflanzenr. IV. 50, Heft 80: 204. 1922. San Ramón, *Endres s. n.* Known only from the type collection.

**Oncidium stenobulbon** Kränzlin, Pflanzenr. IV. 50, Heft 80: 281. 1922. On the Río Jesús, *Endres s. n.* Known only from the type collection.

**Oncidium stenotis** Reichenb. f. Linnaea 41: 67. 1876. Without locality, *Hort. Low.* A number of Costa Rican collections have been examined. Endemic.

**Oncidium Storkii** Ames & Schweinf. Sched. Orch. 10: 106. 1930. Santa María de Dota, *Stork s. n.* Known only from the type collection.

**Oncidium tetraskelidion** Kränzlin, Pflanzenr. IV. 50, Heft 80: 259. 1922. Without locality, *Endres 285.* Known only from the type collection.

**Oncidium Titania** Schlechter, Repert. Sp. Nov. Beih. 19: 67. 1923. Without locality, *Wercklé 63.* Six other collections are referred to this species: Without locality, *Endres* (determined as *O. glossomystax* Reichenb. f. by Reichenbach); La Fuente, *Alfaro 253;* District of Río Chis near Juan Viñas, *A. & C. Brade 1237;* Turrialba, *A. & C. Brade 1238;* and Llanuras de San Carlos, *A. & C. Brade 1239.*

**Oncidium Tonduzii** Schlechter, Repert. Sp. Nov. 9: 31. 1910. Santo Domingo de Golfe Dulce, *Tonduz 9891.* Known only from the type collection.

**Oncidium turialbae** Schlechter, Repert. Sp. Nov. 9: 32. 1910. Near Turrialba, 570 meters, *Biolley 8423.* Known only from the type collection.

**Oncidium Warscewiczii** Reichenb. f. A number of Costa Rican collections are referable to this species. The species occurs also in Panama.

**Oncidium Wentworthianum** Bateman ex Lindl. Kränzlin records this species from Costa Rica: *Carmiol.*

## ORCHIDOTYPUS Kränzlin

A single representative of this small genus has been found in Central America. The stems are about 5 cm. tall, leafy to the summit, with tiny white flowers in axils of the upper leaves.

**Orchidotypus muscoides** Kränzlin. Several collections of this species from Costa Rica have been examined. Also in Peru.

## ORNITHIDIUM Salisb.

A large, polymorphic genus. Many of the species are characterized by an elongate, free-hanging rhizome bearing pseudobulbs at more or less regular intervals.

**Ornithidium Alfaroi** Ames & Schweinf. Sched. Orch. 10: 98. 1930. La Fuente, 1,200 meters, *Alfaro 227*. Two other collections are referable to this species: Oak forest near Quebradillas, about 7 km. north of Santa María de Dota, *Standley 43054;* and vicinity of El Copey, *Standley & Valerio 43996*. Endemic.

**Ornithidium anceps** Reichenb. f. Beitr. Orch. Centr. Amer. 75. 1866. Cartago, *Wendland*. *O. neglectum* Schltr. Repert. Sp. Nov. Beih. 19: 242. 1923 (Hort. Dahlem, Schlechter; also San Pedro de San Ramón, *Brenes 164*). Frequent; in Guanacaste. Nicaragua and Panama.

**Ornithidium costaricense** Schlechter, Repert. Sp. Nov. 8: 456. 1910. Rancho Flores, 2,040 meters, *Pittier 2177*. Frequent. Endemic.

**Ornithidium fulgens** Reichenb. f. Beitr. Orch. Centr. Amer. 76. 1866. Naranjo, *Wendland*. Frequent. Also in Panama.

**Ornithidium Lankesteri** Ames, Sched. Orch. 4: 52. 1923. San Cristóbal, 1,650 meters, *Lankester & Sancho 421*. A number of collections of this species have been examined. Endemic.

**Ornithidium paleatum** Reichenb. f. Original habitat given only as Central America.

**Ornithidium Pittieri** Ames, Sched. Orch. 2: 35. 1923. San Isidro de Heredia, Las Lajas, 1,500 meters, *Pittier* (*Herb. Inst. Phys.-Geogr. Costar. 14048*). One other collection is referable to this species: Vara Blanca, *Jiménez & Maxon 2071*. Endemic.

**Ornithidium Schlechterianum** C. Schweinf. Bot. Mus. Leafl. Harv. Univ. 4: 94. 1937. *Camaridium imbricatum* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 415. 1918. La Palma, 1,500 meters, *Wercklé s. n.;* also same locality, 2,500 meters, *Wercklé* (*Herb. O. Jiménez 671*). Several collections are referable to this species. Endemic.

**Ornithidium sigmoideum** C. Schweinf. Bot. Mus. Leafl. Harv. Univ. 4: 121. 1937. Cerro Gallito, 2,000 meters, *M. Valerio 72*. Also at La Palma de San José, 1,600 meters, *Standley 33058, 33065*. Endemic.

**Ornithidium stenophyllum** Schlechter, Repert. Sp. Nov. Beih. 19: 59. 1923. San Jerónimo, *Wercklé 109*. Known only from the type collection.

**Ornithidium strumatum** Endres & Reichenb. f. Gard. Chron. n. ser. 2: 772. 1874. Without locality, *Endres*. Known only from the type collection.

**Ornithidium Wercklei** Schlechter, Repert. Sp. Nov. Beih. 19: 60. 1923. San Jerónimo, 1,400 meters, *Wercklé 61*. Several collections of this species have been examined; in Guanacaste. Endemic.

**Ornithidium Wrightii** (Schlechter) C. Schweinf. *Lankester 571* from Costa Rica is referable to this species. Also in Nicaragua.

## ORNITHOCEPHALUS Hook.

A genus comprising about 28 species, characterized by distichous, equitant leaves and small flowers in which the column suggests the head of a bird.

**Ornithocephalus bicornis** Lindl. *O. xiphochilus* Schltr. Repert. Sp. Nov. 3: 251. 1907 (vicinity of the Río Chirripó, 300 meters, *Pittier 16509*). *Zygostates costaricensis* Nash, Bull. Torrey Club 34: 122. 1907 (Finca Navarro, *Maxon 680*). Rather frequent in Costa Rica; in Guanacaste. Guatemala and Panama.

**Ornithocephalus inflexus** Lindl. One Costa Rican collection is referred to this species: El Oriente, Turrialba, *Lankester 852*. Also in Mexico.

**Ornithocephalus Lankesteri** Ames, Sched. Orch. 3: 24. 1923. Las Cóncavas, 1,410 meters, *Lankester 368*. One other collection is referable to this species: Near La Palma, *Brenes (153)484*. Endemic.

**Ornithocephalus Tonduzii** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 420. 1923. Without locality, *Tonduz s. n.* Known only from the type collection.

**Ornithocephalus Valerioi** Ames & Schweinf. Sched. Orch. 10: 103. 1930. Province of Guanacaste, El Silencio, near Tilarán, 750 meters, *Standley & Valerio 44672*. Known only from the type collection.

## OSMOGLOSSUM Schlechter

A small genus closely related to *Odontoglossum* and *Miltonia*.

**Osmoglossum anceps** Schlechter, Repert. Sp. Nov. Beih. 19: 147. 1923. Without locality, *A. & C. Brade 1180*. Two other col-

lections of this species are known: Palmichal, 1,000 meters, *Alfaro s. n.*, and Las Cóncavas, *Lankester 1105*. Endemic.

**Osmoglossum convallarioides** Schlechter, Repert. Sp. Nov. Beih. 19: 148. 1923. Forests of Santa Rosa de Copey, 1,800 meters, *Tonduz;* also Candelaria Mountains, *A. & C. Brade 1292* (type). Several collections have been examined. Endemic.

**Osmoglossum pulchellum** (Batem.) Schlechter. *Odontoglossum pulchellum* Batem. ex Lindley. Reichenbach cites this species as having been collected in Costa Rica: Cartago, *Oersted*. Also in Mexico and Guatemala.

### PELEXIA Poiteau ex L. C. Rich.

Related to *Spiranthes*, but clearly distinguished from it in having the lateral sepals united to form a conspicuous spur.

**Pelexia congesta** Ames & Schweinf. Sched. Orch. 10: 5. 1930. Moist forest, Guanacaste, La Tejona, 600–700 meters, *Standley & Valerio 33212*. Known only from the type collection.

### PERISTERIA Hook.

**Peristeria elata** Hook. *Espíritu Santo*. This, the celebrated dove or Holy Ghost orchid, is reported to grow in wet forests of the Atlantic coast. It occurs also in Panama, Colombia, and Venezuela. A terrestrial plant, it has handsome, white flowers, the arrangement of whose parts simulates a dove with outspread wings.

### PESCATOREA Reichenb. f.

Leaves equitant at the base, much longer than the axillary peduncles. Flowers large and showy, wax-like in texture, yellow in *P. cerina*. Rolfe, Orch. Rev. 8: 44, 68. 1900.

**Pescatorea cerina** (Lindl.) Reichenb. f. Two collections of this species from Costa Rica have been examined: La Palma, *Brenes (151)481;* Río Cuarto, *Alfaro 131*. Also Panama.

**Pescatorea costaricensis** Schlechter, Repert. Sp. Nov. Beih. 19: 139. 1923. Without locality, *A. & C. Brade 1196*. Known only from the type collection.

### PHRAGMIPEDIUM Rolfe

Low plants with leathery leaves in two ranks; the flowers characterized by a pouch or slipper-like petal technically called the labellum.

**Phragmipedium caudatum** (Lindl.) Rolfe. Reported by Schlechter as occurring in Costa Rica. Described from a Peruvian specimen, also in Ecuador and Panama.

**Phragmipedium longifolium** (Reichenb. f.) Rolfe. Reported by Schlechter as occurring in Costa Rica. Also in Panama and Colombia.

## PHYSOSIPHON Lindl.

Similar in the stems and leaves to *Pleurothallis*, but distinct in having the sepals united to form a tubular calyx.

**Physosiphon Cooperi** Ames, Sched. Orch. 1: 2. 1922. Cartago, 1,500 meters, *Cooper 481*. One other collection of this species has been examined: Vicinity of Santa María de Dota, 1,500–1,800 meters, *Standley 42405*. Endemic.

**Physosiphon minor** Rendle, Journ. Bot. 38: 275. 1900. Without locality, *Tonduz s. n.* Known only from the type collection.

**Physosiphon minutiflorus** Ames & Schweinf. Several collections of this species from Costa Rica have been examined; in Guanacaste. Panama.

**Physosiphon obliquipetalus** Ames & Schweinf. Sched. Orch. 8: 12. 1925. Santa Clara de Cartago, 1,950 meters, *Lankester 680*, also *Lankester 762* from the same locality. Endemic.

## PLEUROTHALLIS R. Br.

*Platystele* Schlechter, Repert. Sp. Nov. 8: 565. 1910. *Pseudoctomeria* Kränzlin, Repert. Sp. Nov. Beih. 34: 219. 1925. *Barbosella* Schlechter, Repert. Sp. Nov. 15: 259. 1918.

Stems usually elongated and tufted, unifoliate at the summit. Leaves coriaceous. Flowers solitary to many on short or much elongated peduncles that emerge from a sheath in the axil of the leaf. Flowers usually small, greenish or yellowish spotted with purple, the sepals much larger than the petals, the lower ones often united.

**Pleurothallis abjecta** Ames. One collection of this species from Cartago and three from Guanacaste have been examined. Also in Guatemala.

**Pleurothallis acicularis** Ames & Schweinf. Sched. Orch. 10: 21. 1930. La Palma, 1,150 meters, *Brenes (159)490*. Also at Santiago de San Ramón, 1,000 meters, *Brenes 1511*. Endemic.

**Pleurothallis Aguilarii** Ames, Sched. Orch. 9: 28. 1925. Barba Volcano, *Standley 33157* (collected by *Aguilar*). Endemic.

**Pleurothallis alpina** Ames. Numerous collections of this species from Costa Rica have been examined. Also in Panama.

**Pleurothallis Amparoana** Schlechter, Repert. Sp. Nov. Beih. 19: 23. 1923. San Jerónimo, 1,350 meters, *C. Brade 4*. Three collections made by Alfaro and one by Lankester are referable to this species, likewise *Brenes 1262* from the region of San Ramón. Endemic.

**Pleurothallis angusta** Ames & Schweinf. Sched. Orch. 8: 23. 1925. Cultivated at Las Cóncavas, probably native of Cachí, *Lankester 850*. One other collection is referred to this species: Vicinity of Pejivalle, *Standley & Valerio 47031*. Endemic.

**Pleurothallis aperta** (Kränzl.) Ames, Sched. Orch. 7: 17. 1924. *Masdevallia aperta* Kränzl. Repert. Sp. Nov. 17: 430. 1921 (on the Río Pascita Grande, *Endres 652*). *P. hamata* Rolfe, Orch. Rev. 24: 187. 1916, nomen; ampl. Ames, Sched. Orch. 3: 8. 1923 (*Lankester 350*). A few collections made by Standley at El Muñeco, south of Navarro, belong to this species. Also in Panama.

**Pleurothallis arietina** Ames, Sched. Orch. 4: 16. 1923. La Estrella, *Lankester & Sancho s. n.* A rather common species. Also in Panama.

**Pleurothallis barbae** Schlechter, Repert. Sp. Nov. Beih. 19: 104. 1923. Barba Volcano, 2,000 meters, *A. & C. Brade 1127*. A number of collections of this species from the Province of Heredia have been seen. Endemic.

**Pleurothallis Blaisdellii** S. Wats. *P. peraltensis* Ames, Sched. Orch. 6: 65. 1923 (Peralta, *Lankester 484*). There are two other collections of this species from Santa María de Dota: *Stork 1209a* and *Standley & Valerio 43320*. Also in Guatemala and British Honduras.

**Pleurothallis Bradeorum** (Schltr.) Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 3: 39. 1934. *Barbosella Bradeorum* Schlechter, Repert. Sp. Nov. Beih. 19: 111. 1923. El Tablazo, 1,900 meters, *A. & C. Brade 1226;* also La Palma, *A. & C. Brade 1098*. Endemic.

**Pleurothallis brevis** Schlechter, Repert. Sp. Nov. Beih. 19: 183. 1923. Vicinity of Cartago, 1,450 meters, *Brenes 276;* also

Los Angeles de Heredia, *Brenes 13*, and San Pedro de San Ramón, *Brenes 40*. Several collections of this species have been examined. Endemic.

**Pleurothallis brunnescens** Schlechter, Repert. Sp. Nov. Beih. 19: 183. 1923. San Pedro de San Ramón, 1,100 meters, *Brenes 27*. Two collections are referred (ex char.) to this species: Vicinity of Pejivalle, *Standley & Valerio 46825* and *46846*. Endemic.

**Pleurothallis cachensis** Ames, Sched. Orch. 4: 17. 1923. Cachí, 1,125–1,200 meters, *Lankester 76*. One other collection of this species has been examined: Navarro, *Lankester 931*. Endemic.

**Pleurothallis calyptrostele** Schlechter, Repert. Sp. Nov. Beih. 19: 23. 1923. San Jerónimo, 1,350 meters, *Wercklé 148*. Several Costa Rican collections belong to this species. Endemic.

**Pleurothallis canae** Ames. Several Costa Rican collections belong to this species; in Guanacaste. Panama.

**Pleurothallis cardiothallis** Reichenb. f. *P. costaricensis* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 395. 1918, non Rolfe (San Ramón, 1,500–1,600 meters, *Tonduz; Herb. Nac. Costa Rica 17647*). *P. Schlechterianum* Ames, Sched. Orch. 2: 24. 1923. A number of Costa Rican collections are referable to this species; Guanacaste. Guatemala and Nicaragua.

**Pleurothallis carpinterae** Schlechter, Repert. Sp. Nov. Beih. 19: 105. 1923. La Carpintera, *A. & C. Brade 1214*. Several collections of this species have been examined. Endemic.

**Pleurothallis casualis** Ames, Sched. Orch. 9: 30. 1925. La Hondura, 1,300–1,700 meters, *Standley 36517*. Also at La Palma de San Ramón, 1,150 meters, *Brenes 1391*. Endemic.

**Pleurothallis caudatisepala** C. Schweinf. Bot. Mus. Leafl. Harv. Univ. 4: 113. 1937. Entre La Balsa y Cataratas de San Ramón, 800 meters, *Brenes 1445*. Endemic.

**Pleurothallis cedralensis** Ames, Sched. Orch. 4: 18. May, 1923. Cedral, 1,500 meters, *Lankester 352;* also La Estrella de Cartago, *Lankester & Sancho 399*. *P. myrtillus* Schlechter, Repert. Sp. Nov. Beih. 19: 108. November, 1923 (La Palma, 1,800 meters, *A. & C. Brade 1106*, and same locality, *S. Wercklé; Herb. Inst. Phys.-Geogr. Costar. 11592*). A rather common species. Endemic.

**Pleurothallis cerea** Ames, Sched. Orch. 4: 19. 1923. Agua Caliente, *Lankester 358*. Known only from the type collection.

**Pleurothallis ciliilabia** Schlechter, Repert. Sp. Nov. Beih. 19: 185. 1923. "La Calera" de San Mateo, 850 meters, *Brenes 215*. Known only from the type collection.

**Pleurothallis circumplexa** Lindl. Two collections lacking flowers are tentatively referred to this species: Near Quebradillas, north of Santa María de Dota, *Standley 43091* and *43108*. Also in Mexico and Guatemala.

**Pleurothallis cobanensis** Schlechter. La Palma de San Ramón, 1,150 meters, *Brenes 1389, 1631*. Extending to Guatemala.

**Pleurothallis Cogniauxiana** Schlechter, Repert. Sp. Nov. 3: 246. January, 1907. Between La Palma and Carillo, *Herb. Inst. Phys.-Geogr. Costar. 2457*. A fairly common species at 1,200–1,900 meters. Endemic.

**Pleurothallis compacta** (Ames) Ames & Schweinf. *Platystele bulbinella* Schlechter, Repert. Sp. Nov. 8: 565. 1910 (woods of Rancho Flores, 2,043 meters, *Pittier 2013*). Fairly common in Costa Rica. Also in Guatemala.

**Pleurothallis concaviflora** C. Schweinf. Bot. Mus. Leafl. Harv. Univ. 4: 114. 1937. Colinas de San Pedro de San Ramón, *Brenes 1668*. Known only from the original collection.

**Pleurothallis Convallaria** Schlechter, Repert. Sp. Nov. Beih. 19: 185. 1923. San Pedro de San Ramón, 1,100 meters, *Brenes 84*. Two other collections are referred to this species: *Brenes (140)470* and *Lankester 841* (ex char.). Endemic.

**Pleurothallis corniculata** (Sw.) Lindl. Several collections of this species from Guanacaste and the region of San Ramón have been examined. Also in Guatemala and West Indies.

**Pleurothallis costaricensis** Rolfe, Kew Bull. 80. 1917. Hort. Kew, *Lankester s. n. P. erhartiiflora* Schltr. Repert. Sp. Nov. Beih. 19: 187. 1923 (San Pedro de San Ramón, 1,000 meters, *Brenes 141*). Fairly common. Endemic.

**Pleurothallis crassilabia** Ames & Schweinf. Sched. Orch. 8: 25. 1925. Alto de La Estrella, *Lankester 807*. Two other collections are referable to this species: Tobosi, *Lankester 535*, and Alto de La Estrella, *Standley 39136*. Endemic.

**Pleurothallis crescentilabia** Ames, Sched. Orch. 4: 20. 1923. Without locality, *Lankester 359*. Several other Costa Rican collections have been examined. Endemic.

**Pleurothallis cruciformis** Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 3: 39. 1934. *Restrepia Reichenbachiana* Endres ex Reichenb. f. Gard. Chron. n. ser. 4: 356. 1876 (*Endres*), non *P. Reichenbachiana* Schltr. *Barbosella Reichenbachiana* Schltr. Repert. Sp. Nov. Beih. 19: 26. 1923. Two other collections of this species are known: San Jerónimo, *Wercklé 98*, and border of Río Grande at Naranjo, *Brenes 3*. Endemic.

**Pleurothallis decipiens** Ames & Schweinf. Sched. Orch. 8: 26. 1925. Arenal, 600 meters, *Valerio 68*. A few other collections have been examined; Guanacaste. Endemic.

**Pleurothallis dentipetala** Rolfe ex Ames, Sched. Orch. 3: 7. January, 1923. *Lankester s. n. P. Cooperi* Schltr. Repert. Sp. Nov. Beih. 19: 286. November, 1923 (vicinity of Cartago, *Cooper*). *S. stelidiformis* Schlechter, Repert. Sp. Nov. Beih. 19: 195. 1923 (Santiago de San Ramón, *Brenes 150*). Two other collections are referable to this species: *Lankester 1042* and *Brenes (123)453*. Endemic.

**Pleurothallis divexa** Ames, Sched. Orch. 7: 20 1924. *P. dichotoma* Ames, Sched. Orch. 6: 58. 1923, non Schltr. (Peralta, 360 meters, *Lankester 464*). Two other collections are referred to this species: *Lankester 1144* and *Standley 33730*. Endemic.

**Pleurothallis dolichopus** Schlechter. *P. poasensis* Ames, Sched. Orch. 1: 10. 1922 (Poás Volcano, 2,500 meters, *Pittier 3054*). *P. peregrina* Ames, Sched. Orch. 6: 67. 1923 (Jucosal?, *Lankester 469*). A rather common species. Also in Guatemala.

**Pleurothallis dolichopus** var. **Bradeorum** Schlechter, Repert. Sp. Nov. Beih. 19: 106. 1923. El Tablazo, 1,900 meters, *A. & C. Brade 1047*. Known only from the type collection.

**Pleurothallis endotrachys** Reichenb. f. Linnaea 41: 95. 1876. *Endres s. n.* Known only from the type collection.

**Pleurothallis eumecocaulon** Schlechter, Repert. Sp. Nov. Beih. 19: 187. District Volís de San Ramón, 1,270 meters, *Brenes 232*. A number of collections from San José Province belong to this species. Endemic.

**Pleurothallis excavata** Schlechter, Repert. Sp. Nov. Beih. 19: 287. 1923. Vicinity of San Ramón, *Acosta s. n.* Known only from the type collection.

**Pleurothallis fantastica** Ames, Bot. Mus. Leafl. Harv. Univ. 4: 45. *pl.* 1936. Province of San José, vicinity of El General, 850 meters, *Skutch 2391*. Endemic.

**Pleurothallis flavescens** Schlechter, Repert. Sp. Nov. Beih. 19: 188. 1923. Near San Ramón, 1,025 meters, *Brenes 185*. A few other collections of this species have been seen. Endemic.

**Pleurothallis fractiflexa** Ames & Schweinf. Sched. Orch. 10: 26. 1930. Province of Heredia, Yerba Buena, northeast of San Isidro, 2,000 meters, *Standley & Valerio 49902*, also *49910*. Endemic.

**Pleurothallis fulgens** Reichenb. f. Gard. Chron. n. ser. 4: 516. 1875. *Endres*. *P. Brenesii* Schltr. Repert. Sp. Nov. Beih. 19: 182. 1923 (San Pedro de San Ramón, 950 meters, *Brenes 30*). Several other Costa Rican collections are referable to this species; in Guanacaste. Panama.

**Pleurothallis gacayana** Schlechter. *P. cingens* Ames & Schweinf. Sched. Orch. 10: 23. 1930 (La Fuente, 1,200 meters, *Alfaro 186*). Known in Costa Rica only from the type collection of *P. cingens*. Also in Guatemala.

**Pleurothallis gelida** Lindl. *P. polyliria* Endr. & Reichenb. f. Gard. Chron. 1483. 1871 (*Endres*). Several Costa Rican collections of this species have been examined; Guanacaste. Florida and West Indies.

**Pleurothallis geminicaulina** Ames, Sched. Orch. 6: 59. 1923. La Unión, Turrialba, 1,050 meters, *Lankester 454*. Several collections have been examined. Endemic.

**Pleurothallis geminiflora** Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 3: 39. 1934. *P. biflora* Schltr. Repert. Sp. Nov. Beih. 19: 181. 1923, non Focke (near San Ramón, 1,025 meters, *Brenes 176*). Known only from the type collection.

**Pleurothallis gonioglossa** Schlechter, Repert. Sp. Nov. Beih. 19: 188. 1923. Near San Ramón, 1,025 meters, *Brenes 178*. One other collection is known: La Palma, *Brenes 70*. Endemic.

**Pleurothallis grandis** Rolfe, Kew Bull. 234. 1918. *Lankester 3*. Three other collections of this species have been seen. Endemic.

**Pleurothallis guanacastensis** Ames & Schweinf. Sched. Orch. 10: 27. 1930. Province of Guanacaste, Quebrada Serena, southeast of Tilarán, 700 meters, *Standley & Valerio 46304*. Four other collections from Guanacaste have been seen. Endemic.

**Pleurothallis hastata** Ames. Two collections from Costa Rica have been tentatively referred to this species: Cerro de La Carpintera, *Standley 34252*, and La Estrella, *Standley 39486*. Also in Mexico and Guatemala.

**Pleurothallis hirsuticaulis** Ames & Schweinf. Sched. Orch. 10: 29. 1930. Vicinity of Pejivalle, 900 meters, *Standley & Valerio 47052*. One other collection from the same locality, without flowers, is referred to this species: *Standley & Valerio 47233*. Endemic.

**Pleurothallis homalantha** Schlechter, Repert. Sp. Nov. Beih. 19: 106. 1923. El Tablazo, 1,900 meters, *A. & C. Brade 1160*. *P. homalanthoides* Schltr. Repert. Sp. Nov. Beih. 19: 190. 1923 (San Pedro de San Ramón, 1,150 meters, *Brenes 68*). *P. nemorum* Schltr. Repert. Sp. Nov. Beih. 19: 191. 1923 (San Pedro de San Ramón, 1,100 meters, *Brenes 76*). Rather common. Endemic.

**Pleurothallis hondurensis** Ames. Four specimens from the Province of Limón are referred to this species: *Standley & Valerio 48697a, 48719, 48745*, and *Standley 36954*. Also in Honduras.

**Pleurothallis immersa** Linden & Reichenb. f. *P. calerae* Schltr. Repert. Sp. Nov. Beih. 19: 184. 1923 (Alto de La Calera de San Mateo, 850 meters, *Brenes 288*). A few collections of this species have been seen. Also in Colombia and Mexico.

**Pleurothallis integrilabia** Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 3: 39. 1934. *P. dryadum* Schltr. Repert. Sp. Nov. Beih. 19: 186. 1923, non Schltr. 1922 (San Pedro de San Ramón, 950 meters, *Brenes 36*). Known only from the type collection.

**Pleurothallis Johannis** Schlechter. *P. melicoides* Schltr. Repert. Sp. Nov. Beih. 19: 23. 1923 (La Palma, *Wercklé 44*). Several collections of this species from Costa Rica have been examined. Also in Guatemala.

**Pleurothallis lancilabris** (Reichenb. f.) Schlechter, Repert. Sp. Nov. 12: 205. 1913. *Stelis lancilabris* Reichenb. f. Beitr. Orch. Centr. Amer. 94. 1866 (Desengaño, *Wendland 902*). *P. Schulzeana* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 396. 1918 (La Carpintera, 1,800 meters, *C. Brade s. n.*). Fairly common in Costa Rica. Also in Guatemala.

**Pleurothallis lateritia** Reichenb. f. Gard. Chron. 731. 1872. *Endres*. Known only from the type collection.

**Pleurothallis lentiginosa** Lehm. & Kränzl. ex Kränzl. Bot. Jahrb. 26: 446. 1899. Irazú Volcano, *Lehmann 1750. Pseudoctomeria lentiginosa* Kränzl. Repert. Sp. Nov. Beih. 34: 220. 1925. Several collections of this species have been seen. Endemic.

**Pleurothallis leucopyramis** Reichenb. f. Linnaea 41: 47. 1876. *Hort. W. Saunders.* Reported by Reichenbach f. (Xen. Orch. 3: 14) as probably from Costa Rica. No specimens seen.

**Pleurothallis listerophora** Schlechter, Repert. Sp. Nov. 3: 107. 1906. Near La Uruca, *Pittier 2986* (collected by Biolley). Several collections from the Vicinity of Santa María dè Dota made by Standley and Valerio seem referable to this species. Endemic.

**Pleurothallis longipedicellata** Ames & Schweinf. Sched. Orch. 8: 27. 1925. La Estrella, *Lankester 792.* One other collection is referred to this species: Alto de La Estrella, *Standley 39081.* Endemic.

**Pleurothallis longissima** Lindl. *P. lyroglossa* Schltr. Repert. Sp. Nov. 8: 566. 1910 (woods of Nicoya, *Tonduz 13731*). Frequent in Costa Rica. Also in Mexico, Panama, and Jamaica.

**Pleurothallis luctuosa** Reichenb. f. Linnaea 41: 48. 1876 (no habitat given). Three collections from Costa Rica belong to this species: Sabanillas de Acosta, *Lankester 1178;* Piedades de San Ramón, 1,000 meters, *Brenes 1506;* San Pedro de San Ramón, *Brenes 69;* and Schlechter cites the following collections: La Palma, 1,400 meters, *A. & C. Brade 1104* and *1216.* Probably endemic.

**Pleurothallis marginata** Lindl. Three Costa Rican collections have been seen: La Palma de San Ramón, *Brenes 1709;* Calera de San Mateo, *Brenes 265;* and San Mateo de San Ramón, *Brenes 540.* Also from Mexico to Panama.

**Pleurothallis melanopus** Lehm. & Kränzl. ex Kränzl. Bot. Jahrb. 26: 443. 1899. *Lehmann s. n.* Schlechter cites this as questionably from Costa Rica.

**Pleurothallis microtatantha** Schlechter, Repert. Sp. Nov. 3: 276. 1907. Rancho Flores, 2,040 meters, *Tonduz 2156.* Several collections are referable to this species. Endemic.

**Pleurothallis minimiflora** Schlechter, Repert. Sp. Nov. Beih. 19: 288. 1923. Near La Palma, *Wercklé 110.* One other collection of this species has been seen: Pejivalle, *Lankester 863.* Endemic.

**Pleurothallis minuta** Ames & Schweinf. Sched. Orch. 10: 30. 1930. La Palma, 1,100 meters, *Brenes (13)343*. Several additional collections have been seen from the region of San Ramón. Endemic.

**Pleurothallis minutipetala** Ames & Schweinf. Sched. Orch. 10: 32. 1930. Bosque de C. Laguna, 1,190 meters, *Brenes (102)432*. One other collection has been seen: Zarcero, *Jiménez & Lankester 2078*.

**Pleurothallis monstrabilis** Ames, Sched. Orch. 6: 63. 1923. Vicinity of La Palma on the road to La Hondura, 1,500–1,700 meters, *Maxon & Harvey 8096*. *Barbosella Brenesii* Schlechter, Repert. Sp. Nov. Beih. 19: 201. 1923 (San Pedro de San Ramón, 1,075 meters, *Brenes 165*). Rather frequent. Endemic.

**Pleurothallis moschata** Reichenb. f. Xen. Orch. 3: 42. 1881. *Endres*. Provinces of Cartago and Heredia; not common.

**Pleurothallis nana** Ames & Schweinf. Sched. Orch. 8: 29. 1925. Pejivalle, *Lankester 865*. Several other collections from Alajuela, Heredia, and Cartago are referred to this species. Endemic.

**Pleurothallis naraniensis** Reichenb. f. Beitr. Orch. Centr. Amer. 96. 1866. Naranjo, *Wendland 593*. One other collection is recorded: Vicinity of San Ramón, *Acosta*. Endemic.

**Pleurothallis navarrensis** Ames, Sched. Orch. 9: 34. 1925. El Muñeco, south of Navarro, *Standley 33888;* also *Standley 33865*. Endemic.

**Pleurothallis nervosa** Braid, Kew Bull. 201. 1924. Cachí District, 1,200–1,500 meters, *Lankester s. n.* Perhaps referable to *P. homalantha*. Known only from the type collection.

**Pleurothallis ophiocephala** Lindl. Two collections from Guanacaste are referred to this species: El Silencio, near Tilarán, *Standley & Valerio 44851;* and La Tejona, north of Tilarán, *Standley & Valerio 45967*. Also in Mexico and Guatemala.

**Pleurothallis ovatilabia** Ames & Schweinf. Sched. Orch. 10: 33. 1930. Vicinity of Pejivalle, 900 meters, *Standley & Valerio 47213a*. Also Honduras and Panama.

**Pleurothallis pachyglossa** Lindl. Several Costa Rican collections are referable to this species. Also in Mexico and Guatemala.

**Pleurothallis palliolata** Ames, Proc. Biol. Soc. Wash. 35: 86. 1922. *Lankester 192–1920*. A number of collections from Heredia Province belong to this species. Endemic.

**Pleurothallis pantasmii** Reichenb. f. Several Costa Rican collections are referable to this species; in Guanacaste. Nicaragua.

**Pleurothallis papillifera** Rolfe, Kew Bull. 77. 1916. *Lankester*. Known only from the type collection.

**Pleurothallis peperomioides** Ames, Sched. Orch. 6: 64. 1923. Peralta, *Lankester 465*. Three collections without flowers are tentatively referred to this species: El Muñeco, *Standley 33889;* El Muñeco, *Standley & Torres 51764;* and La Tejona, north of Tilarán, *Standley & Valerio 46039*. Endemic.

**Pleurothallis pergrata** Ames, Sched. Orch. 4: 24. 1923. La Estrella de Cartago, 1,500 meters, *Lankester & Sancho 436*. One other collection, also from La Estrella, has been seen: *Lankester 1032*. Endemic.

**Pleurothallis periodica** Ames, Sched. Orch. 7: 21. 1924. Peralta, *Lankester 463*. Several collections of this species have been examined. Endemic.

**Pleurothallis perplexa** Reichenb. f. One collection of this species from Costa Rica has been seen: San Pedro de San Ramón, 1,100 meters, *Brenes 110*. Original habitat unknown.

**Pleurothallis phyllocardia** Reichenb. f. Beitr. Orch. Centr. Amer. 97. 1866. Desengaño, *Wendland 973*. Two collections from Cartago are referable to this species: La Estrella, *Lankester 402*, and El Muñeco, *Standley & Valerio 51694*. Endemic.

**Pleurothallis phyllocardioides** Schlechter, Repert. Sp. Nov. Beih. 19: 193. 1923. Vicinity of San Ramón, 1,025 meters, *Brenes 290*. *P. Acostaei* Schltr. Repert. Sp. Nov. Beih. 19: 295. 1923 (vicinity of San Ramón, *Acosta*). Several collections are referable to this species. Endemic.

**Pleurothallis platyrachis** Rolfe, Journ. Bot. 28: 136. 1890, in nota. *Masdevallia platyrachis* Rolfe, Gard. Chron. III. 4: 178. 1888 (*Hort. Shuttleworth*). *Kraenzlinella platyrachis* Rolfe, Orch. Rev. 23: 326. 1915. Known only from the type collection.

**Pleurothallis plumosa** Lindl. Four Costa Rican collections are referable to this species: Turrialba, *Collarino 1098* (ex char.); vicinity of Pejivalle, *Standley & Valerio 46844, 47298,* and *47306*. Also in Venezuela and Trinidad.

**Pleurothallis pompalis** Ames, Sched. Orch. 7: 23. 1924. La Carpintera, 1,650 meters, *Lankester 512*. Also at Vara Blanca, Heredia, *Rómulo Valerio 355*. Endemic.

**Pleurothallis Powellii** Schlechter. One collection from Costa Rica is probably referable to this species: Vicinity of Orosi, *Standley 39906*. Also in Panama.

**Pleurothallis praegrandis** Ames. One collection from Costa Rica appears to be referable to this species: La Palma, 1,600 meters, *Standley 33222*. Also in Panama.

**Pleurothallis propinqua** Ames, Sched. Orch. 6: 68. 1923. Vara Blanca, between Poás and Barba volcanoes, *Maxon & Harvey 8268*. Two other collections from Vara Blanca are referable to this species: *Jiménez & Maxon 2072* and *2073*. Endemic.

**Pleurothallis prorepens** (Reichenb. f.) Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 3: 39. 1934. *Restrepia prorepens* Reichenb. f. Gard. Chron. n. ser. 7: 810. 1877 (*Endres*). *Barbosella prorepens* Schltr. Repert. Sp. Nov. 15: 263. 1918. Two other collections of this species are known: San Pedro de San Ramón, *Brenes 123*, and vicinity of San Ramón, *Acosta*. Endemic.

**Pleurothallis pruinosa** Lindl. *P. pauciflora* Schltr. Repert. Sp. Nov. Beih. 19: 192. 1923 (near San Ramón, 1,125 meters, *Brenes 177*). Rather common in Costa Rica; Guanacaste. West Indies and northern South America.

**Pleurothallis Purpusii** Schlechter. Three Costa Rican collections are referable to this species: Peralta, *Lankester 986;* Province of Limón, Hamburg Finca on Río Reventazón below Cairo, *Standley & Valerio 48710* and *48897*. Also in Mexico and Guatemala.

**Pleurothallis quinqueseta** Ames, Sched. Orch. 9: 35. 1925. La Hondura, 1,300–1,700 meters, *Standley 36283*. One other collection from the same locality has been seen: *Standley 36368*. Endemic.

**Pleurothallis ramonensis** Schlechter, Repert. Sp. Nov. Beih. 19: 193. 1923. San Pedro de San Ramón, 1,150 meters, *Brenes 88*. Known only from the type collection.

**Pleurothallis rectipetala** Ames & Schweinf. Sched. Orch. 8: 32. 1925. Cachí, *Lankester 915*. Two other collections from the Province of Cartago belong to this species: Santa María, Estrella

Road, *Stork 1489* (collected by Danielson), and El Muñeco, south of Navarro, *Standley 33866*.

**Pleurothallis rhodoglossa** Schlechter. One collection from Costa Rica is cited by Schlechter as belonging to this species: San Pedro de San Ramón, 1,100 meters, *Brenes 70*. Also in Panama.

**Pleurothallis Rowleei** Ames, Sched. Orch. 1: 11. 1922. La Palma, *W. W. & H. E. Rowlee 236*. *P. cucullata* Ames, Sched. Orch. 3: 5. 1923 (*Lankester 192-20-1* in Herb. Kew.). A number of collections of this species have been examined. Endemic.

**Pleurothallis ruscifolia** (Jacq.) R. Br. *P. glomerata* Ames, Sched. Orch. 4: 21. 1923 (Cachí, *Lankester 357*). Common in Costa Rica. Reported by Schlechter from Guatemala and Salvador, and in the West Indies.

**Pleurothallis saccata** Ames, Sched. Orch. 4: 25. 1923. *Lankester K.340*. Known only from the type collection.

**Pleurothallis samacensis** Ames. One Costa Rican collection is tentatively referred to this species. Also in Guatemala.

**Pleurothallis Sanchoi** Ames, Sched. Orch. 4: 26. 1923. La Estrella, *Lankester & Sancho 394*. Two other collections of this species are known: La Unión, Peralta, *Lankester 482*, and La Tejona, north of Tilarán, *Standley & Valerio 45983*. Endemic.

**Pleurothallis scandens** Ames, Sched. Orch. 5: 18. 1923. La Estrella, *Lankester & Sancho 401*. Several other collections have been seen. Endemic.

**Pleurothallis segoviensis** Reichenb. f. *P. Wercklei* Schlechter, Repert. Sp. Nov. 9: 213. 1911 (without locality, *Wercklé s. n.*). *P. bifalcis* Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 395. 1918 (La Palma, *Wercklé s. n.*). Several collections from Costa Rica have been examined. Ranging from Guatemala to Panama.

**Pleurothallis segregatifolia** Ames & Schweinf. Sched. Orch. 8: 33. 1925. La Fuente, Peralta, *Lankester 914*. Two collections from Guanacaste, La Tejona, north of Tilarán, 600–700 meters, *Standley & Valerio 45954* and *45976*, belong to this species. Endemic.

**Pleurothallis sigmoidea** Ames & Schweinf. Sched. Orch. 10: 36. 1930. Province of Guanacaste, vicinity of Tilarán, *Standley & Valerio 46653*. Several other collections from Guanacaste have been examined. Endemic.

**Pleurothallis Simmleriana** Rendle, Journ. Bot. 38: 274. 1900. *Tonduz* ex Hort. Barbey. Known only from the type collection.

**Pleurothallis simplex** Ames & Schweinf. Sched. Orch. 10: 37. 1930. Cerro de Las Vueltas, 2,700–3,000 meters, *Standley & Valerio 44023*. Also from the same locality *Standley & Valerio 43652, 43664,* and *44011*. Endemic.

**Pleurothallis sororia** Schlechter, Repert. Sp. Nov. 10: 294. 1912. Rancho Flores, 2,043 meters, *Pittier 2157*. *Kraenzlinella sororia* Rolfe, Orch. Rev. 23: 326. 1915. Four other collections from the Province of Cartago have been seen: *Lankester 576* and *1103; Standley 41502; Stork 2140*. Also in Panama.

**Pleurothallis spectabilis** Ames & Schweinf. Three collections from Costa Rica are referred to this species: La Palma, 1,150 meters, *Brenes 164*, and Province of Guanacaste, La Tejona north of Tilarán, 600–700 meters, *Standley & Valerio 45875;* Piedades de San Ramón, 1,100 meters, *Brenes 1458*. Endemic.

**Pleurothallis Standleyi** Ames, Sched. Orch. 9: 37. 1925. El Muñeco, south of Navarro, *Standley 33607*. Three other collections are referred to this species: El Muñeco, *Standley 33796;* El Muñeco, on Río Navarro, *Standley & Valerio 51688;* and near the Finca del Volcán de Turrialba, *Standley 35339*. Endemic.

**Pleurothallis stenostachya** Reichenb. f. A rather common species in Costa Rica; Guanacaste. Mexico to Panama.

**Pleurothallis stenostachya** Reichenb. f. var. **Lankesteri** (Rolfe) Ames, Sched. Orch. 7: 31. 1924. *P. Lankesteri* Rolfe, Kew Bull. 210. 1914. *Lankester*. Several collections of the variety have been examined. Endemic.

**Pleurothallis strumosa** Ames, Sched. Orch. 9: 41. 1925. La Carpintera, *Lankester 766*. Three other collections are referred to this species: Yerba Buena, northeast of San Isidro, 2,000 meters, *Standley & Valerio 49157* and *49171;* and Zurquí, 2,000–2,500 meters, *Standley & Valerio 48055*. Endemic.

**Pleurothallis testaefolia** (Sw.) Lindl. One Costa Rican collection is referred to this species: Agua Caliente, *Lankester 577*. Also in the West Indies.

**Pleurothallis Tonduzii** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 397. 1918. San Ramón, 1,500–1,600 meters, *Tonduz* (*Herb.*

*Mus. Nac. Costa Rica 17646*). Several collections of this species have been seen. Endemic.

**Pleurothallis trachychlamys** Schlechter. Three collections from Guanacaste have been tentatively referred to this species: Vicinity of Tilarán, *Standley & Valerio 44409;* El Arenal, *Standley & Valerio 45137;* and Naranjos Agrios, *Standley & Valerio 46438.* Also in Panama.

**Pleurothallis trachystoma** Schlechter, Repert. Sp. Nov. Beih. 19: 196. 1923. San Pedro de San Ramón, 950 meters, *Brenes 40.* Known only from the type collection.

**Pleurothallis trachytheca** Lehm. & Kränzl. Several Costa Rican collections are questionably referred to this species. Also in Colombia.

**Pleurothallis tribuloides** Lindl. Several collections, mostly from Guanacaste, have been seen. Also in Mexico, Guatemala, Panama, and West Indies.

**Pleurothallis Tuerckheimii** Schlechter. *P. megachlamys* Schltr. Repert. Sp. Nov. Beih. 19: 108. 1923 (El Tablazo, 1,900 meters, *A. & C. Brade 1329*). Several other Costa Rican collections are referable to this species. Also in Guatemala.

**Pleurothallis ujarensis** (Reichenb. f.) Lindl. Fol. Orch. Pleurothallis 19. 1859. *Restrepia ujarensis* Reichenb. f. Bonplandia 3: 225. 1855 (Ujarás, *Oersted*). Rather common; in Guanacaste. Endemic.

**Pleurothallis uncinata** Fawcett. *P. Alexandrae* Schltr. Repert. Sp. Nov. Beih. 19: 103. 1923 (El Tablazo, 1,900 meters *A. & C. Brade 1159*). Fairly common in Costa Rica. Also in Jamaica.

**Pleurothallis vaginata** Schlechter, Repert. Sp. Nov. Beih. 19: 197. 1923. San Pedro de San Ramón, 1,200 meters, *Brenes 122.* Several other collections have been seen. Extending to Guadeloupe, British Guiana, and Bolivia.

**Pleurothallis velaticaulis** Reichenb. f. *P. Pittieri* Schltr. Repert. Sp. Nov. 3: 247. 1907 (banks of Río Manewan, 2,100 meters, *Pittier 2067*). Several collections, mostly from the Province of San José, have been examined. Also Panama, West Indies, and Venezuela.

**Pleurothallis vilipensa** Reichenb. f. Schlechter cites this species as occurring in Costa Rica: Río Jesús de San Ramón, 850 meters, *Brenes 258.* Original habitat given as Central America.

**Pleurothallis villosa** Knowles & Westc. Schlechter cites this species as occurring in Costa Rica: Vicinity of San Ramón, 1,125 meters, *Brenes 217*. Also Mexico, Trinidad, and British Guiana.

**Pleurothallis vinacea** Ames, Sched. Orch. 6: 69. 1923. *Lankester s. n.* A few horticultural specimens seen. Endemic.

**Pleurothallis violaceorosea** Schlechter, Repert. Sp. Nov. Beih. 19: 198. 1923. Santiago de San Ramón, 1,075 meters, *Brenes 153*. Two other collections are referred to this species: La Palma, *Brenes (162)493*, and La Hondura, *Standley 37973*.

**Pleurothallis vittariifolia** Schlechter, Repert. Sp. Nov. Beih. 19: 26. 1923. San Jerónimo, *Wercklé 117*. Several other collections of this species have been seen; in Guanacaste. Endemic.

## POLYCYCNIS Reichenb. f.

A small genus of about six species. The flowers are conspicuously spotted and in *P. barbata* the lip is copiously hairy.

**Polycycnis barbata** (Lindl.) Reichenb. f. Two collections of this species from Costa Rica have been examined: Cachí, *Lankester 354*, and La Fuente, 1,200 meters, *Alfaro 134*. Also in Colombia.

**Polycycnis gratiosa** Endres & Reichenb. f. Gard. Chron. 1451. 1871. Without locality, *Endres s. n.* Known only from the type collection.

## POLYSTACHYA Hook.

A large, polymorphic genus with representatives in the tropical regions of the eastern and western hemispheres. Epiphytes with inconspicuous, usually greenish flowers.

**Polystachya costaricensis** Schlechter, Repert. Sp. Nov. Beih. 19: 233. 1923. Maderal de San Mateo, 450–600 meters, *Brenes 94*. Also in Panama.

**Polystachya masayensis** Reichenb. f. Frequent in Costa Rica; Guanacaste. Panama.

**Polystachya minor** Fawcett & Rendle. Frequent in Costa Rica; Guanacaste. Mexico, Guatemala, Honduras, West Indies, and Peru.

## PONERA Lindl.

A small genus of about six species. Flowers inconspicuous, terminal or lateral; sepals and petals with purplish stripes.

**Ponera striata** Lindl. Two collections from Peralta have been seen: *Lankester 916* and *955*. Also in Mexico, Guatemala, and Salvador.

### PONTHIEVA R. Br.

A small genus of terrestrial plants characterized in part by having the petals and labellum borne high on the column.

**Ponthieva formosa** Schlechter, Repert. Sp. Nov. Beih. 19: 12. 1923. San Jerónimo, *Wercklé 135*. Known only from the type collection. Too close to *P. maculata*.

**Ponthieva graciliscapa** Schlechter, Repert. Sp. Nov. Beih. 19: 166. 1923. Moist woods, San Pedro de San Ramón, 1,150 meters, *Brenes 100*. Known only from the type collection.

**Ponthieva maculata** Lindl. *P. Brenesii* Schltr. Repert. Sp. Nov. Beih. 19: 165. 1923 (moist woods, San Pedro de San Ramón, 1,200 meters, *Brenes 83*). Several collections of this species from Costa Rica have been seen. Also in Mexico, Colombia, and Venezuela.

**Ponthieva racemosa** (Walt.) Mohr. *P. costaricensis* Schltr. Repert. Sp. Nov. Beih. 19: 84. 1923 (El Tablazo, 1,500 meters, *A. & C. Brade 1264*). Frequent in Costa Rica. A widespread species, ranging from Virginia to Venezuela and Ecuador, also in the West Indies.

### PSEUDOCENTRUM Lindl.

In this genus the lateral sepals are united to form a cup-like or pitcher-like spur. The only species known to occur in Central America is extraordinarily rare.

**Pseudocentrum Hoffmannii** Reichenb. f. Linnaea 41: 53. 1876. *Pelexia Hoffmannii* Reichenb. f. Beitr. Orch. Centr. Amer. 102. 1866 (Barba Volcano, *Hoffmann*). Two other collections of this species, also from Barba Volcano, are *Tonduz s. n.* and *Pittier & Durand 3052*. Endemic.

### PTERICHIS Lindl.

A small genus of eleven species. Sepals light green; lip greenish to yellow with dark purple markings.

**Pterichis costaricensis** Ames & Schweinf. Sched. Orch. 10: 10. 1930. In grassy swamp, Poás Lake, 2,550 meters, *Stork 2344*. Known only from the type collection.

## RESTREPIA HBK.

Similar in vegetative structures to *Pleurothallis*. Flowers solitary, characterized by the dorsal sepal and petals being prolonged into slender tails with thickened tips. Schlechter, Repert. Sp. Nov. 15: 263. 1918.

**Restrepia angustilabia** Schlechter, Repert. Sp. Nov. Beih. 19: 240. 1923. Vicinity of San Ramón, *Acosta*. Known only from the type collection.

**Restrepia Dayana** Reichenb. f. Gard. Chron. n. ser. 4: 257. 1875. *Endres*. One other collection has been referred to this species: San Pedro de San Ramón, 1,075 meters, *Brenes 161*. Endemic.

**Restrepia Lankesteri** Ames & Schweinf. Sched. Orch. 10: 20. 1930. La Estrella de Cartago, *Lankester & Sancho 423*. One other collection from the same locality has been examined: *Lankester 1141*.

**Restrepia pilosissima** (Schlechter) Ames & Schweinf. Bot. Mus. Leafl. Harv. Univ. 4: 100. 1937. *Pleurothallis pilosissima* Schlechter, Repert. Sp. Nov. Beih. 19: 289. 1923. Vicinity of San Ramón, *Acosta*. Collected also by Brenes (No. 1320). Endemic.

**Restrepia subserrata** Schlechter, Repert. Sp. Nov. Beih. 19: 291. 1923. Vicinity of San Ramón, *Acosta*. One collection is referred (ex char.) to this species: Province of Alajuela, Viento Fresco, 1,600–1,900 meters, *Standley & Torres 48014*. Endemic.

**Restrepia xanthophthalma** Reichenb. f. *R. Tonduzii* Schltr. Repert. Sp. Nov. Beih. 19: 291. 1923 (La Palma, *Tonduz s. n.*). Fairly common in Costa Rica; Guanacaste. Guatemala and Panama.

## RODRIGUEZIA Ruiz & Pavón

A small epiphyte with pale yellow flowers borne in few-flowered racemes that arise from the base of a flattened pseudobulb.

**Rodriguezia compacta** Schlechter, Repert. Sp. Nov. Beih. 19: 144. 1923. Atlantic coast, on the Finca Gebrüder Hundrisser, *A. & C. Brade 1309*. One other collection is referable to this species: Estrella Valley, *Alfaro 155*. Endemic.

## SARCOGLOTTIS Presl

Large, fleshy terrestrials with large, greenish flowers in conspicuous racemes.

**Sarcoglottis picta** (Anders.) Klotzsch. Reasonably common, especially in Guanacaste, 500–900 meters. Also in Panama, British Guiana, Brazil, and West Indies.

**Sarcoglottis Smithii** (Reichenb. f.) Schlechter, Beih. Bot. Centralbl. 37, Abt. 3: 422. 1922. *Spiranthes Smithii* Reichenb. f. Gard. Chron. 842. 1868 (near Cartago, *Smith s. n.*). *Gyrostachys Smithii* Kuntze, Rev. Gen. 2: 664, 1891. *Spiranthes Bradei* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 376. 1918 (San José, *Brade s. n.*). *Sarcoglottis Bradei* Schltr. Beih. Bot. Centralbl. 37, Abt. 2: 415. 1920. Known only from the type collections. Endemic.

**Sarcoglottis valida** Ames, Sched. Orch. 2: 12. 1923. Vicinity of San José, 1,135 meters, *Biolley 3521*. Several collections from Cartago and San José provinces, 1,070–1,650 meters, have been examined. Endemic.

## SCAPHOSEPALUM Pfitzer

Similar to *Masdevallia*, but the labellum is uppermost and the united lateral sepals form a hood above it. Kränzlin, Repert. Sp. Nov. Beih. 34: 204. 1925.

**Scaphosepalum anchoriferum** (Reichenb. f.) Rolfe, Journ. Bot. 28: 137. 1890. *Masdevallia anchorifera* Reichenb. f. Gard. Chron. n. ser. 21: 577. 1884 (*Hübsch s. n.*). One other collection has been tentatively referred to this species: San Cristóbal, 1,800 meters, *Lankester 424*. Endemic.

**Scaphosepalum Endresianum** Kränzlin, Repert. Sp. Nov. 17: 435. 1921. Without locality, *Endres s. n.* Known only from the type collection.

**Scaphosepalum naviculare** Kränzlin, Repert. Sp. Nov. 17: 436. 1921. Without locality, *Endres s. n.* Known only from the type collection.

**Scaphosepalum Pittieri** Schlechter, Repert. Nov. Sp. 3: 78. 1906. Valley of Agua Buena (Cañas Gordas), 1,100 meters, *Pittier* (*Herb. Inst. Phys.-Geogr. Costar. 11143*). Known only from the type collection.

**Scaphosepalum Standleyi** Ames, Sched. Orch. 9: 24. 1925. Province of Cartago, Cerro de La Carpintera, 1,500–1,850 meters, *Standley 34477*. A number of collections of this species have been seen. Endemic.

**SCAPHYGLOTTIS** Poepp. & Endl.

Epiphytes with simple or branched stems. The small flowers are usually terminal at the summit of a thickened stem or pseudobulb and are usually subtended by conspicuous, sheathing bracts. *Pachystele* Schlechter, Repert. Sp. Nov. Beih. 19: 28. 1923.

**Scaphyglottis albida** (Reichenb. f.) Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 456. 1918. *Ponera albida* Reichenb. f. Beitr. Orch. Centr. Amer. 103. 1866 (Llanos del Carmen, *Hoffmann s. n.*). Known only from the type collection.

**Scaphyglottis amethystina** (Reichenb. f.) Schlechter. *S. brachiata* Schltr. Repert. Sp. Nov. 9: 432. 1911 (forests of Nicoya, *Tonduz; Herb. Phys.-Geogr. Costar. 13729*). Several Costa Rican collections have been examined. Also in Guatemala and Panama.

**Scaphyglottis Behrii** (Reichenb. f.) Benth. & Hook. f. ex Hemsley. *S. pauciflora* Schltr. Repert. Sp. Nov. 3: 47. 1906 (Ujarrás de Buenos Aires, *Pittier 10627*). Several collections from Costa Rica are referable to this species; Guanacaste. British Honduras, Guatemala, and Panama.

**Scaphyglottis bilineata** (Reichenb. f.) Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 456. 1918. *Ponera bilineata* Reichenb. f. Beitr. Orch. Centr. Amer. 88. 1866 (San Miguel, *Wendland 810*). Known only from the type collection.

**Scaphyglottis bilobulata** Schlechter, Repert. Sp. Nov. Beih. 19: 113. 1923 (without locality, *A. & C. Brade s. n.*). Known only from the type collection.

**Scaphyglottis Bradeorum** Schlechter, Repert. Sp. Nov. Beih. 19: 113. 1923. Without locality, *A. & C. Brade s. n.* Only the type collection can be definitely assigned to this species, though several other collections may belong to it.

**Scaphyglottis corallorrhiza** (Ames) Ames, Hubbard & Schweinf. Bot. Mus. Leafl. Harv. Univ. 3: 40. 1934. *Pachystele corallorrhiza* Ames, Sched. Orch. 9: 45. 1925 (Las Nubes, 1,500–1,900 meters, *Standley 38909*). One other collection is definitely referable to this species: Cerro Gallito, 2,000 meters, *M. Valerio*, and several others without flowers are probably referable to it.

**Scaphyglottis cuneata** Schlechter. *Tetragmestus gracilis* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 400. 1918 (forests of Tuis, 650 meters, *Tonduz; Herb. Inst. Phys.-Geogr. Costar. 11588*). *Scaphy-*

*glottis gracilis* Schltr. Repert. Sp. Nov. Beih. 19: 28. 1923. One other Costa Rican collection is referable to this species: Dulce Nombre, 1,400 meters, *Standley 35892*, and two collections, without flowers, from the Province of Limón are probably referable to it: Vicinity of Guápiles, *Standley 37409* and *37422*. Also in Guatemala, Nicaragua, and Panama.

**Scaphyglottis Jimenezii** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 399. 1918. La Palma, 1,700 meters, *Wercklé* (*Herb. O. Jiménez 682*). *Pachystele densa* Schltr. Repert. Sp. Nov. Beih. 19: 29. 1923 (La Palma, *Wercklé 71*). *Pachystele Jimenezii* Schltr. Repert. Sp. Nov. Beih. 19: 30. 1923. Frequent; Guanacaste. Endemic.

**Scaphyglottis mesocopis** (Endr. & Reichenb. f.) Benth. & Hook. f. ex Hemsl. Biol. Centr. Amer. Bot. 3: 220. 1883. *Ponera mesocopis* Endr. & Reichenb. f. Xen. Orch. 2: 222. 1874 (without locality, *Endres s. n.*). Several collections of this species from Costa Rica have been examined; Guanacaste. Panama.

**Scaphyglottis subulata** Schlechter, Repert. Sp. Nov. 8: 454. 1910. Near Cartago, *Biolley 1367*. Known only from the type collection.

**Scaphyglottis unguiculata** Schlechter. Several collections of this species from Costa Rica have been examined. Also in Guatemala, Honduras, and Panama.

**Scaphyglottis Wercklei** Schlechter, Repert. Sp. Nov. Beih. 19: 28. 1923. San Jerónimo, *Wercklé 105*. Several collections from Costa Rica are referable to this species. Also in Panama.

## SCELOCHILUS Klotzsch

A small genus of inconspicuous plants.

**Scelochilus aureus** Schlechter, Repert. Sp. Nov. Beih. 19: 144. 1923. El Tablazo, 1,600 meters, *A. & C. Brade 1063*. Known only from the type collection.

## SCHOMBURGKIA Lindl.

Showy epiphytes with large, hollow stems and with elongated flower shoots bearing loose racemes or panicles of showy flowers. The stems are inhabited by ants.

**Schomburgkia Lueddemannii** Prillieux. One Costa Rican collection of this species has been examined: Escobal, 370 meters, *Alfaro 40*. Also in Panama and Venezuela.

**Schomburgkia tibicinis** Bateman. Schlechter reports this species from Costa Rica, but no specimens from there have been seen. Also in Mexico, Guatemala, and Honduras.

## SEPALOSACCUS Schlechter

Repert. Sp. Nov. Beih. 19: 244. 1923. Low epiphytes with densely tufted, one-leaved, slender pseudobulbs. The flowers hardly exceed the pseudobulbs and appear among them.

**Sepalosaccus humilis** Schlechter, Repert. Sp. Nov. Beih. 19: 245. 1923. San Pedro de San Ramón, 1,075 meters, *Brenes 130*. One other collection is known: Bosque Aquileo en La Palma, *Brenes (146)476*. Endemic.

## SIEVEKINGIA Reichenb. f.

Beitr. Syst. Pflanzenk. 3. 1871. Small, pseudobulbous epiphytes with lateral flower shoots.

**Sievekingia fimbriata** Reichenb. f. Flora 69: 449. 1886. Without locality, *Endres s. n.* Known only from the type collection.

**Sievekingia suavis** Reichenb. f. Beitr. Syst. Pflanzenk. 3. 1871. Without locality, *Endres s. n.* One other Costa Rican collection is referable to this species: Aguas Zarcas (San Carlos), *Jiménez & Lankester 2005*. Also in Panama.

## SIGMATOSTALIX Reichenb. f.

A small genus allied to *Oncidium*, the small flowers being characterized by the unguiculate lip and elongated column. Kränzlin, Pflanzenr. IV. 50, Heft 80: 301. 1922.

**Sigmatostalix costaricensis** Rolfe, Kew Bull. 78. 1916. Without locality, *Lankester* (Hort. Kew.). *S. poikilostalix* Kränzl. Pflanzenr. IV. 50, Heft 80: 310. 1922 (without locality, *Endres 38* and *97*. Several other collections from Costa Rica are referable to this species. Also in Panama.

**Sigmatostalix hymenantha** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 419. 1918. Carillo, 300 meters, *Wercklé s. n.* A number of collections have been examined; Guanacaste. Endemic.

**Sigmatostalix macrobulbon** Kränzlin, Pflanzenr. IV. 50, Heft 80: 307. 1922. Without locality, *Endres s. n.* Several other collections of this species have been examined. Endemic.

## SOBRALIA Ruiz & Pavón

Terrestrial or epiphytic plants with strongly ribbed leaves, several of the species with large and showy, purplish, yellow or white, membranaceous flowers which remain in perfection only a very short time.

**Sobralia Amparoae** Schlechter, Repert. Sp. Nov. Beih. 19: 8. 1923. In the garden of Mme. Amparo de Zeledón, San José, *Tonduz 51*. Rather common, especially in Guanacaste. Also in British Honduras.

**Sobralia atropubescens** Ames & Schweinf. Sched. Orch. 10: 2. 1930. Pejivalle, *Lankester 928*. Known only from the type collection.

**Sobralia Bletiae** Reichenb. f. This species has been referred to Costa Rica (Chiriquí) by John Lindley, but the Warscewicz plant cited probably came from Panama.

**Sobralia Bradeorum** Schlechter, Repert. Sp. Nov. Beih. 19: 80. 1923. San José, 1,130 meters, *A. & C. Brade 1070*. One other specimen from San Mateo, 850 meters, *Brenes 299*, was examined. Endemic.

**Sobralia Corazoi** Lankester & Ames, Sched. Orch. 7: 34. 1924. Peralta, 4,000 ft., *Lankester 538*. Provinces of San José and Limón. Endemic.

**Sobralia Fenzliana** Reichenb. f., cited by Reichenbach (Beitr. Orch. Centr. Amer. 9. 1866) as coming from Chiriquí, Costa Rica, based on a Warscewicz collection, was probably actually from Panama. Also from Nicaragua (fide Schlechter) and Panama.

**Sobralia fragrans** Lindl. Several fruiting specimens from Costa Rica are tentatively referred to this species. Also in Guatemala, Honduras, and Panama.

**Sobralia labiata** Warsc. & Reichenb. f. Cited by Lindley (Fol. Orch. Sobralia 4. 1854) as occurring in Chiriquí, Costa Rica, but the Warscewicz specimen probably came from Panama.

**Sobralia lepida** Reichenb. f. Beitr. Orch. Centr. Amer. 68. 1866. Desengaño, *Wendland 972*. Two other specimens from Heredia Province have been seen. Endemic.

**Sobralia leucoxantha** Reichenb. f. Beitr. Orch. Centr. Amer. 68. 1866. Desengaño, *Wendland*. Occurs in the provinces of Cartago and San José, 1,200–1,700 meters. Also in Panama.

**Sobralia Lindleyana** Reichenb. f. Cited by Reichenbach (Beitr. Orch. Centr. Amer. 68. 1866) as occurring in Alajuela, Desengaño. Also in Panama.

**Sobralia macra** Schlechter, Repert. Sp. Nov. Beih. 19: 161. 1923. Los Angeles de Heredia, 1,500 meters, *Brenes 295*. In the provinces of San José and Turrialba, 1,200–1,800 meters. Endemic.

**Sobralia macrantha** Lindl. Occurs in the provinces of Cartago and San José. Also in Mexico, Guatemala, Salvador, and Nicaragua (fide Schlechter).

**Sobralia macrophylla** Reichenb. f. Cited by Lindley and Schlechter as occurring in Costa Rica. The Schlechter reference is to *Tonduz 21*, a specimen from the garden of Mme. Amparo de Zeledón from a plant said to be of Costa Rican origin. Also in Panama and Brazil.

**Sobralia mucronata** Ames & Schweinf. Sched. Orch. 8: 54. 1925. San Carlos, *Lankester 764*. Known only from the type collection.

**Sobralia neglecta** Schlechter, Repert. Sp. Nov. Beih. 19: 161. 1923. Maderal de San Mateo, 450 meters, *Brenes 279*. Two collections beside the type have been examined: *Brenes 537* from the type locality, and *Cufodontis 199* from Osa Peninsula. Endemic.

**Sobralia Pfavii** Schlechter, Repert. Sp. Nov. Beih. 19: 272. 1923. Without locality, *Pfau*. Known only from the type collection.

**Sobralia pleiantha** Schlechter, Repert. Sp. Nov. 3: 79. 1906. Forests near Boruca, 450 meters, *Pittier 3855*. Several collections by Standley from the provinces of San José and Cartago have been examined. Endemic.

**Sobralia Warscewiczii** Reichenb. f. A specimen collected at Las Cóncavas, *Lankester 1116*, belongs to this species, and two specimens collected by Brenes (*Nos. 429* and *572*) are tentatively referred to it. Also in Panama.

### SOLENOCENTRUM Schlechter

Repert. Sp. Nov. 9: 163. 1911. Terrestrial herbs with terminal, elongated, densely flowered racemes. Lip forming an elongated, free spur.

**Solenocentrum costaricense** Schlechter, Repert. Sp. Nov. 9: 163. 1911. San Isidro de La Arenilla, 1,400 meters, *Pittier 16723*. Known only from the type collection.

## SPIRANTHES L. C. Rich.

A large genus of usually terrestrial plants (rarely epiphytes) with small flowers in closely or loosely flowered, terminal racemes.

**Spiranthes aguacatensis** Reichenb. f. Bonplandia 3: 214. 1855. Mt. Aguacate, *Oersted. S. Brenesii* Schltr. Repert. Sp. Nov. 10: 481. 1912 (hill of Piedades near San Ramón, 1,100 meters, *Brenes; Herb. Inst. Phys.-Geogr. Costar. 14284*). *Gyrostachys aguacatensis* Kuntze, Rev. Gen. 2: 664. 1891. *Brachystele Brenesii* Schltr. Beih. Bot. Centralbl. 37, Abt. 2: 372. 1920. Also in Guatemala.

**Spiranthes costaricensis** Reichenb. f. Bonplandia 3: 214. 1855. Naranjo, *Oersted. Gyrostachys costaricensis* Kuntze, Rev. Gen. 2: 664. 1891. *Beloglottis costaricensis* Schltr. Beih. Bot. Centralbl. 37, Abt. 2: 365. 1920. Also in Guatemala.

**Spiranthes ecallosa** Ames & Schweinf. Sched. Orch. 10: 7. 1930. La Tejona, north of Tilarán, Province of Guanacaste, 600–700 meters, *Standley & Valerio 45978*. Known only from the type collection.

**Spiranthes elata** (Sw.) L. C. Rich. Several collections from Cartago. A widespread species, ranging from Mexico to Brazil and Ecuador, also in the West Indies. *Sauroglossum nigricans* Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 379. 1918, is probably referable to this species (*Pittier s. n.*).

**Spiranthes minutiflora** A. Rich. & Gal. Two Costa Rican specimens are referable to this species: Turrialba, 2,600 meters, *Pittier* (*Herb. Inst. Phys.-Geogr. Costar. 13083*); and Province of San José, Cerro de Las Vueltas, 2,700–3,000 meters, *Standley & Valerio 43835*. Also in Guatemala.

**Spiranthes parasitica** A. Rich. & Gal. *S. Valerioi* Ames & Schweinf. Sched. Orch. 10: 8. 1930 (Province of San José, Cerro de Las Vueltas, 2,700–3,000 meters, *Standley & Valerio 43952*). Also in Texas and Mexico.

**Spiranthes Prasophyllum** Reichenb. f. Cartago, 500–900 meters, also in Guanacaste. Guatemala and Honduras.

**Spiranthes subpandurata** Ames & Schweinf. One Costa Rican collection has been seen: *Jiménez & Lankester 2081*. Also in Panama.

**Spiranthes Wercklei** Schlechter, Repert. Sp. Nov. 10: 482. 1912. Without locality, *Wercklé s. n.* Known only from the type collection.

### STANHOPEA Frost ex Hook.

Epiphytes with monophyllous pseudobulbs producing lateral flower shoots. Flower large, wax-like, the labellum very fleshy, usually with two diverging horns, one on either side near the middle, the large sepals often conspicuously marked with circular spots.

**Stanhopea cirrhata** Lindl. One collection of this species from Costa Rica has been seen: Pacific slope, *Lankester 1287a.* Also in Nicaragua.

**Stanhopea costaricensis** Reichenb. f. Hamb. Gartenz. 16: 424. 1860. Without locality, *Schiller.* Several collections are known. Endemic.

**Stanhopea ecornuta** Lemaire. Several collections of this Pacific Coast species have been examined. Also in Nicaragua.

**Stanhopea pulla** Reichenb. f. Gard. Chron. n. ser. 7: 810. 1877. Without locality, *Endres s. n.* Known only from the type collection.

**Stanhopea Wardii** Lodd. ex Lindl. Three Costa Rican specimens seem to be referable to this species: San José, *Alfaro s. n.;* Tiribí, 1,000 meters, *Alfaro s. n.;* and Cartago district, *Lankester 1079.* Also in Mexico, Guatemala, and Panama.

**Stanhopea Warscewicziana** Klotzsch, Allgem. Gartenz. 20: 274. 1852. Schlechter cites one collection: Cultivated in the garden of Mme. Amparo de Zeledón, San José, *Wercklé 85.* Endemic.

### STELIS Swartz

Epiphytic herbs, vegetatively similar to *Pleurothallis,* with the terminal flower shoots bearing slender racemes of minute flowers in which the sepals are united at base and much larger than the fleshy labellum and petals.

**Stelis aemula** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 385. 1918. Forests of San Ramón, 1,500–1,600 meters, *Tonduz (Herb. Mus. Nac. Costa Rica 17632b). S. sarcodantha* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 392. 1918 (forests of San Ramón, 1,500–1,600 meters, *Tonduz (Herb. Mus. Nac. Costa Rica 17632).* A common species of Cartago and San José. Also in Panama.

**Stelis carnosiflora** Ames & Schweinf. Sched. Orch. 8: 15. 1925. Navarrito, *Lankester s. n.* Several collections of this species have been seen, mostly from Cartago and San José provinces, 1,200–1,700 meters. Endemic.

**Stelis chihobensis** Ames. Two collections of this species from Pejivalle, Costa Rica, have been seen: *Lankester 840* and *845*. Also in Guatemala.

**Stelis ciliaris** Lindl. *S. Jimenezii* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 389. 1918 ("Ladertena, Hajuelito," *Jiménez 621*). One other Costa Rican collection referable to this species has been seen: Province of San José, vicinity of La Verbena, 1,200 meters, *Standley 32245*. Also in Mexico, British Honduras, and Guatemala.

**Stelis conmixta** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 387. 1918. Forests of San Ramón, 1,500–1,600 meters, *Tonduz* (*Herb. Mus. Nac. Costa Rica 17632a*). Two other collections of this species have been examined: *Brenes 58* and *598*. Endemic.

**Stelis Cooperi** Schlechter, Repert. Sp. Nov. 3: 276. 1907. Near Cartago, 1,300 meters, *Cooper 562*. *S. leptophylla* Schltr. Repert. Sp. Nov. Beih. 19: 174. 1923 (moist forest, San Rafael de San Ramón, 1,250 meters, *Brenes 204*). *S. elliptica* A. & S. Sched. Orch. 8: 16. 1925 (Santa Clara de Cartago, *Lankester 565*). A rather common species in Heredia and San José provinces, up to 2,400 meters. Endemic.

**Stelis costaricensis** Reichenb. f. Bonplandia 3: 225. 1855. Cartago, *Oersted*. *S. minutiflora* A. & S. Sched. Orch. 8: 18. 1925 (Cartago, Reventado, 1,650 meters, *Lankester 522*). Several collections of this species have been seen.

**Stelis crescentiicola** Schlechter, Repert. Sp. Nov. 16: 442. 1920. Two collections from the Province of Limón are referable to this species: Hamburg Finca, on Río Reventazón below Cairo, about 55 meters, *Standley & Valerio 48896* and *48915*. Also in Panama.

**Stelis crystallina** Ames, Bot. Mus. Leafl. Harv. Univ. 3: 45. 1935. La Estrella de Cartago, *Lankester 1010*. Two other collections are referred to this species: Cachí, *Lankester 1051*, and San Ramón, *Brenes (28)323*. Endemic.

**Stelis cucullata** Ames, Sched. Orch. 6: 52. 1923. Hills south of Cartago, *Lankester 475*. Rather common in Costa Rica; Guanacaste. Endemic.

**Stelis cuspidata** Ames, Sched. Orch. 3: 2. 1923. Hort. Kew., *Lankester s. n.* Two other collections are referable to this species: El Muñeco, south of Navarro, about 1,400 meters, *Standley 33720*, and Cerro de Las Lajas, north of San Isidro, 2,000–2,400 meters, *Standley & Valerio 51516*.

**Stelis despectans** Schlechter, Repert. Sp. Nov. 8: 453. 1910. Near La Palma, 1,500 meters, *Pittier 594*. *S. nutantiflora* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 390. 1918 (La Palma, 1,500 meters, *Wercklé 840*). *S. inconspicua* Schltr. Repert. Sp. Nov. Beih. 19: 19. 1923 (San Jerónimo, *Wercklé s. n.*). *S. micragrostis* Schltr. Repert. Sp. Nov. Beih. 19: 95. 1923 (La Palma, 1,400 meters, *A. & C. Brade 1205*). Several other collections from Heredia and San José provinces have been seen. Endemic.

**Stelis effusa** Schlechter, Repert. Sp. Nov. 3: 247. 1907. Near Turrialba, 570 meters, *Tonduz 8279*. *S. distantiflora* Ames, Sched. Orch. 6: 53. 1923 (Hort. Kew., *Lankester s. n.*). Fairly common in Cartago and Limón provinces, also in Guanacaste. Endemic.

**Stelis Endresii** Reichenb. f. Gard. Chron. 1373. 1870. Without locality, *Endres s. n.* *S. glandulosa* Ames, Sched. Orch. 3: 3. 1923 (Hort. Kew., *Lankester s. n.*). *S. propinqua* Ames, Sched. Orch. 6: 55. 1923 (probably near Cachí, *Lankester 468*). *S. praesecta* Schltr. Repert. Sp. Nov. Beih. 19: 175. 1923 (near San Ramón, 1,035 meters, *Brenes 189*). *S. violascens* Schltr. Repert. Sp. Nov. Beih. 19: 176. 1923 (moist woods, San Pedro de San Ramón, 1,200 meters, *Brenes 108*). A fairly common species; Guanacaste. Panama.

**Stelis glossula** Reichenb. f. Gard. Chron. 1373. 1870. *Hort. Veitch.* Buenos Aires de Térraba, *Lankester 1373*.

**Stelis gracilis** Ames. One collection of this species from Costa Rica has been examined: Pejivalle, *Lankester 864*. Also in Guatemala and Nicaragua.

**Stelis guatemalensis** Schlechter. Two collections of this species from La Estrella have been seen: *Lankester 1014* and *1029*. Also in Guatemala.

**Stelis hymenantha** Schlechter. *S. cuspidilabia* Schltr. Repert. Sp. Nov. Beih. 19: 17. 1923 (San Jerónimo, *Wercklé 56*). *S. seleniglossa* Schltr. Repert. Sp. Nov. Beih. 19: 97. 1923 (La Palma, 1,400 meters, *A. & C. Brade 1207*). A rather common species. Also in Guatemala.

**Stelis Lankesteri** Ames, Sched. Orch. 3: 4. 1923. La Florida, 150 meters, *Lankester 365*. Two other collections from La Estrella belong to this species: *Lankester 1017* and *1062*. Endemic.

**Stelis latipetala** Ames, Bot. Mus. Leafl. Harv. Univ. 3: 53. 1935. Cachí, *Lankester 1101*. Endemic.

**Stelis leucopogon** Reichenb. f. Beitr. Orch. Centr. Amer. 95. 1866. Desengaño, *Wendland 858*. *S. cascajalensis* Ames, Sched. Orch. 4: 11. 1923 (Cascajal, 1,650 meters, *Lankester 93*). Fairly plentiful. Also in Guatemala and Panama.

**Stelis microchila** Schlechter. *S. barbata* Rolfe, Kew Bull. 141. 1913 (near Cachí, *Lankester*). *S. costaricensis* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 388. 1918, non Reichenb. f. (El Tablazo, 1,900 meters, *Brade s. n.*). *S. cinerea* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 444. 1918. *S. bryophila* Schltr. Repert. Sp. Nov. Beih. 19: 16. 1923 (San Jerónimo, 1,400 meters, *Wercklé 82*). Several collections of this species from the provinces of Heredia and San José have been examined. Also in Guatemala.

**Stelis nubis** Ames, Sched. Orch. 9: 18. 1925. Province of San José, Las Nubes, 1,500–1,900 meters, *Standley 38643*. Several other collections of this species have been examined. Endemic.

**Stelis ovatilabia** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 446. 1918, nomen; Repert. Sp. Nov. 15: 211. 1918. *S. cyclopetala* Schltr. Repert. Sp. Nov. Beih. 19: 279. 1923. Without locality, *Pittier s. n.* One other collection of this species has been seen: 3 miles northeast of El Copey, 2,250 meters, *Stork 1609*. Endemic.

**Stelis pardipes** Reichenb. f. Beitr. Orch. Centr. Amer. 96. 1866. Desengaño, *Wendland 899*. *S. longicuspis* Schltr. Repert. Sp. Nov. 9: 28. 1910 (woods, La Palma, 1,459 meters, *Tonduz 12650*). *S. Albertii* Schltr. Repert. Sp. Nov. Beih. 19: 170. 1923 (moist woods, San Pedro de San Ramón, 1,150 meters, *Brenes 118*). Rather common in the provinces of Heredia and San José. Endemic.

**Stelis parvula** Lindl. *S. microstigma* Reichenb. f. Beitr. Orch. Centr. Amer. 94. 1866 (Desengaño, *Wendland 892*). *S. obscurata* Reichenb. f. Beitr. Orch. Centr. Amer. 95. 1866 (Desengaño, *Wendland 907*). *S. microtis* Reichenb. f. Beitr. Orch. Centr. Amer. 95. 1866 (Desengaño, *Wendland 883*). *S. Bradei* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 385. 1918 (La Carpintera, *Brade s. n.*). *S. rhodochila* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 392. 1918 (near La Palma, *Wercklé; Herb. O. Jiménez 845, 839, 857*). *S. Amparoana* Schltr. Repert. Sp. Nov. Beih. 19: 16. 1923 (San Jerónimo, 1,400 meters, *Wercklé 86*). *S. platycardia* Schltr. Repert. Sp. Nov. Beih. 19: 18. 1923 (La Palma, *Wercklé 147*). *S. Barbae* Schltr. Repert. Sp. Nov. Beih. 19: 94. 1923 (La Carpintera, 1,400 meters, *A. & C. Brade s. n.*). *S. Brenesii* Schltr. Repert. Sp. Nov. Beih. 19: 172.

1923 (wet woods, Santiago de San Ramón, 1,075 meters, *Brenes 148*). *S. brevis* Schltr. Repert. Sp. Nov. Beih. 19: 172. 1923 (wet woods, San Rafael de San Ramón, 1,250 meters, *Brenes 201*). *S. ramonensis* Schltr. Repert. Sp. Nov. Beih. 19: 176. 1923 (near San Ramón, 1,125 meters, *Brenes 184*). A common species in the provinces of San José and Heredia. Also in Guatemala and Nicaragua.

**Stelis pendulispica** Ames, Bot. Mus. Leafl. Harv. Univ. 2: 85. 1934. El Salvaje, Candelaria, 1,700 meters, *Alfaro 141*. Also two other collections under this number (*Alfaro 141*) from Estrella Valley, and a third collection from Sabanillas de Acosta, *Lankester 1175*, are referable to this species. Endemic.

**Stelis persimilis** Ames, Bot. Mus. Leafl. Harv. Univ. 2: 14. 1933. La Carpintera and San Isidro, *Lankester 1050*. Four other collections of this species have been examined. Endemic.

**Stelis Powellii** Schlechter. *Stelis Acostaei* Schltr. Repert. Sp. Nov. Beih. 19: 275. 1923 (vicinity of San Ramón, *Acosta s. n.*). *S. bracteata* Schltr. Repert. Sp. Nov. Beih. 19: 171. 1923 (Santiago de San Ramón, 1,050 meters, *Brenes 155*). Also in Panama.

**Stelis purpurascens** A. Rich. & Gal. *S. Alfaroi* A. & S. Sched. Orch. 8: 14. 1925 (La Fuente, 1,200 meters, *Alfaro s. n.*, also *Alfaro 195* from the same locality). Also in Mexico, Guatemala, and Salvador.

**Stelis Sanchoi** Ames, Sched. Orch. 4: 13. 1923. La Estrella, *Lankester & Sancho 438*. Known only from the type collection.

**Stelis Standleyi** Ames, Sched. Orch. 9: 21. 1925. La Estrella, *Standley 39483*. A few other collections of this species have been examined. Endemic.

**Stelis Storkii** Ames, Bot. Mus. Leafl. Harv. Univ. 3: 54. 1935. Santa María, *Stork 2103*. One other collection is cited: San Cristóbal Road, *Stork 2226*. Endemic.

**Stelis thecoglossa** Reichenb. f. Beitr. Orch. Centr. Amer. 93. 1866. Desengaño, *Wendland 1259*. *S. coiloglossa* Schltr. Repert. Sp. Nov. 8: 453. 1910 (valley of Río Poás, 650 meters, *Pittier 2444*). *S. Alfredii* Schltr. Repert. Sp. Nov. Beih. 19: 93. 1923 (Candelaria Mountains, 1,600 meters, *A. & C. Brade 1334*). A frequent species in Costa Rica. Also in Panama.

**Stelis Tonduziana** Schlechter, Beih. Bot. Centralbl. 36, Abt. 2: 393. 1918. La Hondura, La Palma, 2,500 meters, *O. Jiménez*

*618. S. mirabilis* Schltr. Repert. Sp. Nov. Beih. 19: 96. 1923 (La Palma, *A. & C. Brade 1203*). A number of collections from San José Province have been seen. Endemic.

**Stelis transversalis** Ames, Bot. Mus. Leafl. Harv. Univ. 2: 91. 1934. Peralta, *Lankester 1007*. Also in Panama.

**Stelis triangulabia** Ames, Sched. Orch. 9: 23. 1925. Los Angeles de San Ramón, 1,050 meters, *Brenes 48*. Known only from the type collection.

**Stelis tricuspis** Schlechter, Repert. Sp. Nov. 3: 276. 1907. Near La Uruca, *Pittier 949*. Quite common in Cartago and San José provinces. Endemic.

**Stelis vestita** Ames, Sched. Orch. 6: 56. 1923. Zarcero, *Lankester & Jiménez 460*. Several collections of this species have been seen. Endemic.

**Stelis Wercklei** Schlechter, Repert. Sp. Nov. Beih. 19: 20. 1923. San Jerónimo, *Wercklé 15*. *S. fractiflexa* A. & S. Sched. Orch. 8: 17. 1925 (Estrella, Cartago, *Lankester 791*). A rather common species in Cartago. Endemic.

## STELLILABIUM Schlechter

A small genus of inconspicuous epiphytes with minute flowers.

**Stellilabium distantiflorum** Ames & Schweinf. Sched. Orch. 10: 70. 1925. Alto de La Estrella, 1,800 meters, *Lankester 582*. *Dipterostele minutiflora* Schltr. Repert. Sp. Nov. 19: 70. 1923, excl. syn. (La Palma, *Wercklé*). Several other collections are referable to this species. Endemic.

## STENORRHYNCHUS L. C. Rich.

Mostly terrestrial herbs with usually conspicuous, bright yellow or reddish flowers.

**Stenorrhynchus bracteosus** Ames & Schweinf. Sched. Orch. 8: 6. 1925. Santa Clara de Cartago, 210 meters, *Lankester 572*. One other collection of this species has been examined: Province of San José, Cerro de Las Vueltas, 2,700–3,000 meters, *Standley & Valerio 43768*. Endemic.

**Stenorrhynchus navarrensis** Ames, Sched. Orch. 9: 13. 1925. Province of Cartago, El Muñeco, south of Navarro, 1,400 meters, *Standley 33957*. A fairly common species in the provinces of Heredia and Cartago, 1,400–2,400 meters. Endemic.

**Stenorrhynchus orchioides** (Sw.) L. C. Rich. Pacific slope, 50–100 meters. Also in Florida, Mexico to South America, and West Indies.

**Stenorrhynchus speciosus** (Jacq.) L. C. Rich. Several collections from Cartago, 1,000–1,400 meters, have been examined. Also in West Indies, Colombia, and Venezuela.

**Stenorrhynchus Standleyi** Ames, Sched. Orch. 9: 14. 1925. Province of Cartago, Cerro de La Carpintera, 1,500–1,850 meters, *Standley 34429*. Known only from the type collection.

**Stenorrhynchus Tonduzii** Schlechter, Beih. Bot. Centralbl. 37, Abt. 2: 448. 1920. *Spiranthes Tonduzii* Schltr. Repert. Sp. Nov. 9: 26. 1910 (woods near Boruca, *Tonduz 4645*). Also in Guatemala and Honduras.

## SYSTELOGLOSSUM Schlechter

Repert. Sp. Nov. Beih. 19: 251. 1923. Grass-like epiphytes with slender, lateral flower shoots and inconspicuous flowers.

**Systeloglossum acuminatum** Ames & Schweinf. Sched. Orch. 10: 105. 1930. La Estrella, *Lankester 1091*. Two other collections are known: Yerba Buena, northeast of San Isidro, 2,000 meters, *Standley & Valerio 50188* and *50239*. Endemic.

**Systeloglossum costaricense** Schlechter, Repert. Sp. Nov. Beih. 19: 252. 1923. Alto de Santiago de San Ramón, 1,075 meters, *Brenes 19*. Two other collections of this species have been examined: Estrella Valley, "Pandora," *Alfaro 261;* El Silencio, near Tilarán, *Standley & Valerio 44671*. Endemic.

## TELIPOGON HBK.

Epiphytes with leaves clustered near the base; flowers usually large, with the petals and lip similar and often conspicuously striate. Kränzlin, Ann. Naturhist. Hofmus. Wien 33: 9. 1919.

**Telipogon Biolleyi** Schlechter, Repert. Sp. Nov. 9: 293. 1911. Barba Volcano, *Biolley 1340*. Known only from the type collection.

**Telipogon buenavistae** Kränzlin, Ann. Naturhist. Hofmus. Wien 33: 33. 1919. Buenavista, near the spot called "Ojo de Agua," 3,000 meters, *Endres s. n.* Only one other collection is referred to this species: Cerro de Las Vueltas, *Standley & Valerio 43632*. Endemic.

**Telipogon christobalensis** Kränzlin, Ann. Naturhist. Hofmus. Wien 33: 30. 1919. Near San Cristóbal, *Endres 512*. Known only from the type collection.

**Telipogon costaricensis** Schlechter, Repert. Sp. Nov. 9: 166. 1911. Forests of El General, 600 meters, *Pittier 3527*. One other collection is tentatively referred to this species: South slope, near the Finca del Volcán de Turrialba, 2,000–2,400 meters, *Standley 35329*.

**Telipogon Endresianus** Kränzlin, Ann. Naturhist. Hofmus. Wien 33: 31. 1919. Without locality, *Endres*, also *Hübsch*. One other collection is referred to this species: Pacayas, *Lankester 518*.

**Telipogon gracilipes** Schlechter, Repert. Sp. Nov. Beih. 19: 263. 1923. Palmira, 1,825 meters, *Brenes 8*. One other Costa Rican collection is referred (ex char.) to this species: Cerro de Las Vueltas, *Standley & Valerio 43714*. Endemic.

**Telipogon Lankesteri** Ames, Sched. Orch. 3: 23. 1923. Peralta (Las Lajas), 800 meters, *Lankester 361*. Two other collections are referred to this species: Dulce Nombre, *Standley 35954*, and vicinity of Finca Las Cóncavas, *Standley 41479*. Endemic.

**Telipogon minutiflorus** Kränzlin, Ann. Naturhist. Hofmus. Wien 33: 14. 1919. Without locality, *Endres s. n.* Known only from the type collection.

**Telipogon parvulus** C. Schweinf. Bot. Mus. Leafl. Harv. Univ. 4: 123. 1937. Cerca de La Holanda, *M. Valerio 971*. Known only from the original collection.

**Telipogon Pfavii** Schlechter, Repert. Sp. Nov. 17: 143. 1921. Without locality, *Pfau 9301*. Known only from the type collection.

**Telipogon Standleyi** Ames, Sched. Orch. 9: 53. 1925. Between Aserrí and Tarbaca, 1,600–1,900 meters, *Standley 34120*. Known only from the type collection.

**Telipogon Storkii** Ames & Schweinf. Sched. Orch. 10: 101. 1930. La Chonta, *Stork 2101*. Known only from the type collection.

### TETRAGAMESTUS Reichenb. f.

Epiphytes with superposed or branching stems and clusters of inconspicuous flowers in the axils of the leaves.

**Tetragamestus modestus** Reichenb. f. Schlechter reports this species as questionably from Costa Rica. Also in Puerto Rico, Grenada, and Brazil.

## TRICHOCENTRUM Poepp. & Endl.

Small epiphytes with short, usually one-flowered, lateral flower shoots.

**Trichocentrum Brenesii** Schlechter, Repert. Sp. Nov. Beih. 19: 248. 1923. San Pedro de San Ramón, 1,200 meters, *Brenes 116*. Schlechter cites two other collections: Without locality, *Nevermann s. n.;* San Jerónimo, *Wercklé 139*. Endemic.

**Trichocentrum caloceras** Endres & Reichenb. f. Gard. Chron. 1257, 1871, *in textu*. Without locality, *Endres s. n.* Known only from the type collection.

**Trichocentrum capistratum** Linden & Reichenb. f. Gard. Chron. 1257. 1871. Without locality, *Wallis s. n.* Known only from the type collection.

**Trichocentrum Pfavii** Reichenb. f. Several Costa Rican collections of this species have been examined. Original habitat probably Panama (Chiriquí).

## TRICHOPILIA Lindl.

A group of epiphytes with monophyllous pseudobulbs and lateral flower shoots. Flowers single or few, showy, with the conspicuous labellum forming a tube at base and enclosing the slender column.

**Trichopilia maculata** Reichenb. f. One collection from Costa Rica is referable to this species: Sabanillas de Acosta, *Lankester 1230*. Also in Guatemala and Panama.

**Trichopilia marginata** Henfrey. Two Costa Rican collections seem referable to this species: La Hondura, *Standley 36337*, and Orosi, *Alfaro s. n.* Also in Panama.

**Trichopilia punctata** Rolfe, Gard. Chron. III. 7: 227. 1890. Without locality, *Hort. Sander*. Known only from the type collection.

**Trichopilia suavis** Lindl. & Paxt. in Paxt. Flow. Gard. 1: 44, 53. 1850–51. A number of collections of this species from Costa Rica have been examined; Guanacaste. Panama.

**Trichopilia turialbae** Reichenb. f. Beitr. Orch. Centr. Amer. 69. 1866. Turrialba, *Wendland*. Several collections of this species from Costa Rica have been examined. Endemic.

## TRIGONIDIUM Lindl.

Epiphytes with slender pseudobulbs and elongated, strap-shaped leaves, the inflorescences lateral, erect, bearing a single flower of

which the sepals form a tube at base and become strongly revolute above.

**Trigonidium Egertonianum** Bateman ex Lindl. A number of collections of this species from Costa Rica have been examined; Guanacaste. Mexico, British Honduras, Nicaragua, and Panama.

**Trigonidium Lankesteri** Ames, Sched. Orch. 5: 32. June, 1923. Las Cóncavas, *Lankester 367*. *T. Amparoanum* Schltr. Repert. Sp. Nov. Beih. 19: 61. November, 1923 (Carrillo, *Wercklé 26*).

## TRIPHORA Nutt.

Small, terrestrial plants arising from ovoid tubers. The small, rather inconspicuous flowers are borne in few-flowered racemes.

**Triphora nitida** Schlechter, Repert. Sp. Nov. 17: 139, *in textu*. 1921. *Pogonia nitida* Schltr. Beih. Bot. Centralbl. 36, Abt. 2: 373. 1918. Higuito, 300 meters, *C. Brade 1909*. Moist meadow land. Endemic.

## TRIZEUXIS Lindl.

Small, inconspicuous epiphytes with equitant leaves and loose panicles of minute flowers.

**Trizeuxis falcata** Lindl. Several collections of this species from Costa Rica have been examined. Also in Panama and West Indies.

## TROPIDIA Lindl.

Leafy-stemmed plants with greenish, inconspicuous flowers in dense, terminal panicles.

**Tropidia polystachya** (Sw.) Ames. Schlechter reports this species from Guatemala and Costa Rica; no Central American material has been seen. Also Florida and Cuba.

## VANILLA Swartz

Scandent herbs clambering over rocks, trees, and shrubs, with elliptical, leathery leaves and yellowish or greenish flowers. The fruit consists of elongated capsules which are aromatic in *V. fragrans* and *V. Pompona*. *V. fragrans* is the vanilla of commerce.

**Vanilla fragrans** (Salisb.) Ames. *Vainilla*. A wide-spread species common in cultivation, the chief source of commercial vanilla.

**Vanilla Pfaviana** Reichenb. f. Gard. Chron. n. ser. 20: 230. 1883. Without locality, *Pfau 269*. Up to 1925 known only from the type collection; now known also from Mexico and British Honduras.

**Vanilla Pompona** Schiede. Pie del Turrubares, 150 meters. A species of wide distribution and much cultivated as one source of commercial vanilla. *V. Pittieri* Schlechter, Repert. Sp. Nov. 3: 106. 1906, is probably referable to this species (woods, edge of Río Ceibo near Buenos Aires, about 200 meters, *Pittier 6600*).

## WARREA Lindl.

A small genus with lanceolate leaves and a loose raceme of rather showy flowers.

**Warrea costaricensis** Schlechter, Repert. Sp. Nov. 16: 446. 1920. Forests of La Palma, *Brade 16327*. Known only from the type collection.

## WARSCEWICZELLA Reichenb. f.

About eighteen species of small epiphytes with the leaves clustered at the base and with a lateral flower shoot bearing a single showy flower.

**Warscewiczella discolor** (Lindl.) Reichenb. f. Bot. Zeit. 10: 636. 1852. *La Dolorosa. Warrea discolor* Lindl. Journ. Hort. 4: 265. 1849 (without locality, *Warscewicz*). *Zygopetalum discolor* Reichenb. f. in Walp. Ann. 6: 655. 1863. Numerous collections of this species from Costa Rica have been seen. Also in Panama and Cuba.

**Warscewiczella Wendlandii** (Reichenb. f.) Hort. ex Nash in L. H. Bailey, Stand. Cycl. Hort. 3506. 1917. *Zygopetalum Wendlandii* Reichenb. f. Beitr. Orch. Centr. Amer. 74. 1866 (Mt. Irazú, *Wendland*). Two collections from East Turrialba have been examined: *Alfaro 173*, Aug. 9, 1924, and Sept. 18, 1924. Endemic.

## XYLOBIUM Lindl.

Pseudobulbous epiphytes with lateral racemes of medium-sized flowers.

**Xylobium elongatum** (Lindl. & Paxt.) Hemsl. *Maxillaria elongata* Lindl. & Paxt. Several Costa Rican collections of this species have been examined. Also in Panama.

**Xylobium Powellii** Schlechter. Two Costa Rican collections are referable to this species: Las Cóncavas, *Lankester 1099;* Tarbaca, Central Valley, 1,400 meters, *Alfaro 144*. Also in Panama.

**Xylobium squalens** Lindl. One collection from Costa Rica is referable to this species: Pejivalle, *Lankester 858*. Also in Brazil and Peru.

**Xylobium stachyobiorum** (Reichenb. f.) Hemsl. Several collections from Costa Rica have been examined. This species seems very close to and perhaps is inseparable from the South American *M. foveata* (Reichenb. f.) Nichols. Also in Nicaragua and Panama.

**Xylobium sublobatum** Schlechter, Repert. Sp. Nov. Beih. 19: 51. 1923. In the garden of Mme. Amparo de Zeledón, San José, 1,100 meters, *Tonduz 50*. This species is very close to *X. Powellii*. Known only from the type collection.

## CASUARINACEAE. Beefwood Family

### CASUARINA L. Beefwood

**Casuarina equisetifolia** L. *Pino, Pino de Australia*. Cultivated commonly in parks and fincas as an ornamental tree; native of Asia and Africa. A medium-sized tree, somewhat suggesting a pine in appearance, the leaves reduced to small scales, the branchlets resembling stems of *Equisetum;* fruit a rounded cone. In some regions of the earth the bark is employed for dyeing and tanning.

## PIPERACEAE. Pepper Family

Reference: William Trelease, The Piperaceae of Costa Rica, Contr. U. S. Nat. Herb. 26: 115–226. 1929.

Herbs, shrubs, or small trees; leaves alternate, entire; flowers minute, green, disposed in dense and elongate spikes.

### PEPEROMIA Ruiz & Pavón

Herbaceous plants with thick, fleshy leaves. Most species of the genus are epiphytic plants but a few are terrestrial. In Costa Rica there are more than 140 species, a truly remarkable number, but for the most part they are well marked and less variable than the species of *Piper*.

**Peperomia acutilimba** C. DC. ex Trelease, Contr. U. S. Nat. Herb. 26: 213. 1929. Volcán de Poás, 2,300 meters, *Pittier 249*. Also Cerro de Las Lajas, above San Isidro. Endemic.

**Peperomia aguacalientis** Trelease, Contr. U. S. Nat. Herb. 26: 222. 1929. Agua Caliente, Prov. Cartago, *Pittier 2555*. Cartago to Siquirres. Endemic. The plant has appeared in literature under the names *P. Myrtillus* and *P. rhombea*.

**Peperomia aguacatensis** C. DC. Linnaea 37: 376. 1872. Aguacate, *Oersted 217*. Endemic.

**Peperomia aguacatensis** var. **orosiana** Trelease, Contr. U. S. Nat. Herb. 26: 194. 1929. Orosi, Prov. Cartago, *Standley 39779*.

**Peperomia aguacatensis** var. **picta** Trelease, loc. cit. El Muñeco, Prov. Cartago, 1,400 meters, *Standley & Valerio 51660*.

**Peperomia aguacatensis** var. **urocarpoides** Trelease, loc. cit. Victoria, Zent, *Pittier 16084*.

**Peperomia Alexanderi** Trelease, sp. nov.—Herba mediocris stolonifera erecta glabra, caule 2–3 mm. crasso alato; folia alterna lanceolato-elliptica usque lanceolata acute acuminata, basi acuta, 5.5 cm. longa et 2 cm. lata, 10 cm. longa et 3.5 cm. lata, vel 8 cm. longa et 4 cm. lata, 5-nervia, nervis interioribus plus minusve confluentibus; petiolus circiter 10 mm. longus amplexicauli-decurrens; spicae terminales circiter 50 mm. longae et 3 mm. crassae, pedunculo 10 mm. longo; bracteae rotundo-peltatae; baccae subglobosae, stigmate obliquo.—El General, Prov. San José, 1,010 meters, *Alexander F. Skutch 2631* (type in U. S. Nat. Herb.).

**Peperomia amphitricha** Trelease, Contr. U. S. Nat. Herb. 26: 192. 1919. Quebradillas, near Santa María de Dota, 1,800 meters, *Standley 43089a*. Piedra Blanca, near Escasú; San Ramón. Endemic. The species has been reported for Costa Rica as *P. lanceolato-peltata*.

**Peperomia amphitricha** var. **santa-rosana** Trelease, loc. cit. Santa Rosa de Copey, Prov. San José, *Tonduz 12225*. Region of El Copey.

**Peperomia amphoterophylla** Trelease, Contr. U. S. Nat. Herb. 26: 225. 1929. La Palma, Prov. San José, *Biolley 939*. Frequent about the Meseta Central, descending to Alajuela, and ascending the slopes of the volcanoes; region of San Ramón. Endemic. Reported for Costa Rica under the name *P. galioides* var. *longifolia*.

**Peperomia amphoterophylla** var. **glutineofructa** Trelease, op. cit. 226. Cerro de Las Vueltas, 3,000 meters, *Standley & Valerio 44007*. Cantón de Dota; Escasú.

**Peperomia analectae** Trelease, sp. nov.—Herba ut videtur parva ramosa glabra, caulibus geniculato-flexuosis vix 1 mm. crassis, internodiis brevibus; folia alterna elliptica distincte emarginata,

basi acuta, circiter 2 cm. longa et 1 cm. lata, trinervia, costa supra impressa, subtus elevata, in sicco tenuia, petiolo gracili 5 mm. longo; inflorescentia?—La Palma de San Ramón, *Brenes 20616* (type in Herb. Field Mus.).

**Peperomia antennifera** Trelease, sp. nov.—Herba modice alta repens glabra nodis radicans, internodiis modice elongatis 1–2 mm. crassis; folia rotundo-ovata subabrupte breviacuminata, basi obscure cordulata, 6–7 cm. longa 3–5 cm. lata, e tertio infimo submultipli-5-nervia, in sicco firma opaca, subtus pallidiora, petiolo 2–4.5 cm. longo gracili; spicae 20–30 mm. longae 1 mm. crassae apice pedunculi 4–5 cm. longi geminatae, pedicellis filiformibus 3–4 cm. longis.—El General, Prov. San José, 1,010 meters, *A. F. Skutch 2288* (type in U. S. Nat. Herb.).

**Peperomia atirroana** Trelease, Contr. U. S. Nat. Herb. 26: 208. 1929. Atirro, Prov. Cartago, 600 meters, *J. D. Smith 4927*. Region of San Ramón. Endemic. Reported under the name *P. paniculata*.

**Peperomia barbana** C. DC. Bull. Soc. Bot. Belg. 29, pt. 2: 70. 1890. Las Esmeraldas, Volcán de Barba, *Tonduz 1331*. Known only from the Volcano of Barba.

**Peperomia barbensis** (Dahlst.) Trelease, Contr. U. S. Nat. Herb. 26: 191. 1929. *P. hispidula* var. *barbensis* Dahlst. Svensk. Vet. Akad. Handl. 33, pt. 2: 14. 1900. Volcán de Barba, *Hoffmann 54*. Also El Tablazo and El Copey. Endemic.

**Peperomia barbinodis** Trelease, Contr. U. S. Nat. Herb. 26: 220. 1929. Near Juan Viñas, Prov. Cartago, 1,200 meters, *Tonduz 10419*. Endemic.

**Peperomia bistortifolia** Trelease, Contr. U. S. Nat. Herb. 26: 195. 1929. Cerro de Las Vueltas, 3,000 meters, *Standley & Valerio 44008*. Endemic.

**Peperomia borucana** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 232. 1891. Boruca, *Tonduz 4109*. Also in El General. Endemic.

**Peperomia brachypus** Trelease, Contr. U. S. Nat. Herb. 26: 200. 1929. Camino de Hatillo, near San José, 1,200 meters, *Standley 32159*. Also at Cartago. Endemic.

**Peperomia brevicaulis** Trelease, Contr. U. S. Nat. Herb. 26: 208. 1929. Orosi, Prov. Cartago, *Standley 39667*. El Muñeco. Endemic.

**Peperomia breviscapa** Trelease, Contr. U. S. Nat. Herb. 26: 209. 1929. Finca La Colombiana, Prov. Limón, *Standley 36888*. Wet forests of the Atlantic coast. Endemic.

**Peperomia cacuminicola** Trelease, Contr. U. S. Nat. Herb. 26: 215. 1929. Finca La Cima, north of El Copey, 2,100–2,400 meters, *Standley 42637*. Palmira del Naranjo; region of San Ramón, 1,200–1,300 meters. Endemic.

**Peperomia calvicaulis** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 231. 1891. Camino de Carillo, near La Laguna, *Biolley 3177*. Atlantic Coast, ascending to Orosi and El Muñeco. Endemic.

**Peperomia calvicaulis** var. **perexigua** Trelease, Contr. U. S. Nat. Herb. 26: 214. 1929. Tsaki, Prov. Limón, 200 meters, *Tonduz 9543*.

**Peperomia calvicaulis** var. **subpenninervis** C. DC. Candollea 1: 381. 1923; 3: 122. 1926. Las Vueltas de Tucurrique, *Tonduz 12738*.

**Peperomia calvicaulis** var. **hydnostachya** Trelease, loc. cit. Tuis, Prov. Cartago, 650 meters, *Tonduz 11530*.

**Peperomia calvicaulis** var. **ovata** Trelease, loc. cit. El Arenal, Guanacaste, 500 meters, *Standley & Valerio 45168*. El Muñeco; slopes of Barba. Endemic.

**Peperomia calvifolia** C. DC. Candollea 1: 290, 381. 1923. Santiago, San Ramón, Prov. Alajuela, *Brenes 14182*. Slopes of the central volcanoes; El Muñeco; San Ramón. Endemic.

**Peperomia calvifolia** var. **abrupta** Trelease, Contr. U. S. Nat. Herb. 26: 218. 1929. El Muñeco, Prov. Cartago, 1,400 meters, *Standley 33955*.

**Peperomia calyculata** Trelease, Contr. U. S. Nat. Herb. 26: 207. 1929. La Hondura, Prov. San José, 1,300–1,700 meters, *Standley 36568*. Endemic.

**Peperomia candelaber** Trelease, Contr. U. S. Nat. Herb. 26: 207. 1929. La Palma, Prov. San José, 1,600 meters, *Standley 33010*. Several other collections have been made at the same locality; region of San Ramón. Endemic.

**Peperomia carpinterana** C. DC. in Pittier, Primit. 2: 281. 1899. La Carpintera, Prov. Cartago, *Pittier & Tonduz 6903*. Endemic.

**Peperomia carpinterana** var. **sparsipila** Trelease, Contr. U. S. Nat. Herb. 26: 197. 1929. Cerro de La Carpintera, 1,600 meters, *Standley 35690*.

**Peperomia cartagoana** Trelease, Contr. U. S. Nat. Herb. 26: 222. 1929. *P. reflexa* var. *pallida* C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 235. 1891. San José, *Pittier 3198*. Frequent about the Meseta Central; Cantón de Dota; Aguacate. Endemic.

**Peperomia cataratasensis** Trelease, sp. nov.—Herba subparva (repens?) glabra arboricola, caule 1–3 mm. crasso; folia alterna rotundo-ovata acuta, basi rotundata, 1.5–2.5 cm. longa 1–2 cm. lata, 5-nervia, coriacea, subtus saepe laete lutea, nervis salientibus, petiolo 5–15 mm. longo; spicae terminales atque axillares vix 35 mm. longae et 1 mm. crassae, pedunculo ad 15 mm. longo.—Cataratas (Los Angeles) de San Ramón, *Brenes 20514* (type in Herb. Field Mus.).

**Peperomia Cattii** Trelease, sp. nov.—Herba subparva stolonifero-adsurgens, petiolis aliquanto ciliatis exceptis glabra, caule sursum geniculato 2–3 mm. crasso; folia alterna lanceolato-elliptica vel subrhombica acuminata, basi acuta, circiter 6 cm. longa et 2.5 cm. lata, 5-nervia, subtus granulosa, in sicco subtenuia sed opaca, petiolo 5 mm. longo amplexicauli; spicae terminales et ex axillis supremis 75 mm. longae 1 mm. crassae, pedunculo filiformi 15 mm. longo.—Margin of Bonilla Lakes, Prov. Limón, 300–430 meters, *C. W. Dodge, George Catt & W. S. Thomas 6141* (type in Gray Herb.).

**Peperomia chambesyana** Trelease, Contr. U. S. Nat. Herb. 26: 193. 1929. *P. arifolia* var. *acutifolia* C. DC. ex Trel. Bot. Gaz. 73: 142. 1922. The species was based upon plants cultivated at Chambesy, Switzerland, from seeds received from Costa Rica, The species is unknown in the wild state.

**Peperomia chlorostachya** Trelease, Contr. U. S. Nat. Herb. 26: 203. 1929. Cerro de Las Vueltas, 3,000 meters, *Standley & Valerio 43513*. Collected also near El Copey. Endemic.

**Peperomia chrysocarpa** C. DC. Bull. Soc. Bot. Belg. 29, pt. 2: 70. 1891. San José, *Tonduz 1384*. Central region. Endemic.

**Peperomia ciliifera** Trelease, Contr. U. S. Nat. Herb. 26: 212. 1929. *P. hernandifolia* var. *ciliifera* Trel. Bot. Gaz. 73: 145. 1922. La Estrella, Prov. Cartago, *Cooper 286*. Collected also at La Hondura, and region of San Ramón, at elevations of 1,200–1,300 meters. Endemic.

**Peperomia ciliifera** var. **filipes** Trelease, loc. cit. *P. hernandifolia* var. *filipes* Trel. Bot. Gaz. 73: 145. *pl. 4, f. 18.* 1922. La Palma, Prov. San José, *Tonduz 12539.*

**Peperomia circumscissa** Trelease, Contr. U. S. Nat. Herb. 26: 211. 1929. *P. pendula* C. DC. Anal. Inst. Costa Rica 9: 178. 1897, non Willd. Turrialba, *Pittier 8433.* Collected also at Atirro and Las Vueltas. Endemic.

**Peperomia coliblancoana** Trelease, sp. nov.—Herba parva adsurgens glabra, caule 2 mm. crasso, internodiis brevibus pallidis; folia elliptica obtusa vel emarginulata, basi acuta, circiter 12 mm. longa et 8 mm. lata, coriacea, vix plus quam 1-nervia, petiolo 3–5 mm. longo amplexicauli; spicae terminales circiter 25 mm. longae 2 mm. crassae, pedunculo 10 mm. longo; bracteae rotundo-peltatae; ovarium immersum obovoideum, stigmate interiore.—Finca Coliblanco, Volcán de Turrialba, 1,980 meters, *C. W. Dodge 4516* in 1929 (type in Gray Herb.).

**Peperomia compaginata** Trelease, Contr. U. S. Nat. Herb. 26: 223. 1929. Fraijanes, Prov. Alajuela, 1,500–1,700 meters, *Standley & Torres 47624.* Endemic.

**Peperomia compotrix** Trelease, Contr. U. S. Nat. Herb. 26: 213. 1929. Guápiles, 300–500 meters, *Standley 37490.* Endemic.

**Peperomia Cooperi** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 226. 1891. La Estrella, Prov. Cartago, *Cooper 141.* Common in the Meseta Central. Endemic. Reported for Costa Rica under the names *P. dendrophila* and *P. petiolaris.*

**Peperomia copeyana** C. DC. Candollea 1: 312, 383. 1923. Santa Rosa de Copey, *Tonduz 12228.* Endemic.

**Peperomia costaricensis** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 228. 1891. Between La División and Alto del Palmital, *Pittier 3602.* Also at Turrialba. Endemic.

**Peperomia crispipetiola** Trelease, Contr. U. S. Nat. Herb. 26: 196. 1929. Guápiles, 300–500 meters, *Standley 37455.* Endemic.

**Peperomia cryptolepida** Trelease, Contr. U. S. Nat. Herb. 26: 206. 1929. Finca Hamburgo, Río Reventazón, *Standley & Valerio 48932.* Atlantic coast. Endemic.

**Peperomia Cufodontii** Trelease, Archiv. Bot. 10: 2. 1934. Southwestern slope of Volcán de Irazú, above Guayabillos, 2,500 meters, *Cufodontis 509.* Endemic. Closely related to *P. erythrophlebia.*

**Peperomia cyclophylla** Mart. *Garrapatilla.* Pacific slope. Guatemala to Peru. Reported from Costa Rica as *P. circinata* Link.

**Peperomia defracta** Trelease, sp. nov.—Herba parva erecta simplex vel plus minusve caespitosa glabra, caule vix 2 mm. crasso, internodiis brevibus; folia alterna lanceolato-oblanceolata et utrinque acuta vel obovato-subspathulata et apice obtusa, 15–25 mm. longa 5–8 mm. lata, 3-nervia, subtus elevato-venulosa, coriacea, petiolo 5 mm. longo; spicae terminales 25 mm. longae 1 mm. crassae, pedunculo 10 mm. longo; baccae subglobosae, pseudocupula profunda, stigmate apicali.—El General, Prov. San José, 1,160 meters, *A. F. Skutch 2851* (type in U. S. Nat. Herb.).

**Peperomia delecta** Trelease, Contr. U. S. Nat. Herb. 26: 206. 1929. Alto de La Estrella, Prov. Cartago, *Standley 39097.* Endemic.

**Peperomia delicatissima** Trelease, Contr. U. S. Nat. Herb. 26: 191. 1929. *P. emarginella* var. *glabrior* C. DC. in Pittier, Prim. 2: 287. 1899. Río Naranjo, 200 meters, *Tonduz 8002.* Atlantic slope. Endemic.

**Peperomia disparifolia** Trelease, sp. nov.—Herba majuscula repenti-adsurgens, caule 2 mm. crasso breviter villoso; folia inferne alterna, parium 1–2 superiorum opposita, elliptica utrinque acuta, circiter 5 cm. longa atque 3 cm. lata, opaca, obscure 3–5-nervia, sordido-tomentulosa, petiolo 10–15 mm. longo villoso-tomentuloso; spicae terminales vix 70 mm. longae et 2 mm. crassae, pedunculo 20 mm. longo; bracteae rotundo-peltatae.—Colinas de San Pedro de San Ramón, 1,050 meters, epiphytic, September, 1925, *A. M. Brenes 4436* (type in Herb. Field Mus.).

**Peperomia Dodgei** Trelease, sp. nov.—Herba majuscula aliquanto caespitosa sparse papilloso-puberula, caule 1–3 mm. crasso superne pallido; phyllotaxis dimorpha; folia novellorum et inferiora caulium vetustiorum ad nodum 2–4 lanceolato-oblonga et vix 15 mm. longa atque 5 mm. lata, folia ramorum floriferorum alterna late lanceolata 3–8 cm. longa 1.5–2.5 cm. lata, attenuata, basi acuta, 5-nervia, in sicco subtenuia, petiolo 1–3 mm. longo; spicae terminales et axillares filiformes 30 mm. longae, pedunculo circiter 5 mm. longo; bracteae rotundo-peltatae; ovarium immersum ovoideum, stigmate subapicali.—Above La Unión de Tres Cruces, northwestern slope of Cerro de La Carpintera, 1,460–1,700 meters, *C. W. Dodge & W. S. Thomas 4782* in 1929 (type in Gray Herb.; duplicate in Herb. Field. Mus.).

**Peperomia Donnell-Smithii** C. DC. in Pittier, Prim. 2: 291. 1899. La Concepción, Llanuras de Santa Clara, *J. D. Smith 6742*. Endemic.

**Peperomia dotana** Trelease, Contr. U. S. Nat. Herb. 26: 215. 1929. Laguna de La Chonta, near Santa María de Dota, 2,000 meters, *Standley 42280*. Cantón de Dota, ascending to 3,000 meters. Endemic.

**Peperomia Durandii** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 225. 1891. Volcán de Barba, *Pittier 2015*. Slopes of the volcanoes, at 1,400–1,800 meters; El General. Endemic.

**Peperomia dyscrita** Trelease, Contr. U. S. Nat. Herb. 26: 198. 1929. Río Naranjo, Prov. Cartago, *Tonduz 7518*. Atlantic slope at middle elevations; Cantón de Dota. Endemic. Reported from Costa Rica as *P. alata* R. & P.

**Peperomia emiliana** C. DC. in Pittier, Prim. 2: 292. 1899. La Emilia, Llanuras de Santa Clara, *J. D. Smith 6740*. Atlantic coast. Endemic.

**Peperomia erythrophlebia** Trelease, Contr. U. S. Nat. Herb. 26: 200. 1929. El Muñeco, Prov. Cartago, 1,400 meters, *Standley 33418*. Endemic.

**Peperomia esperanzana** Trelease, Contr. U. S. Nat. Herb. 26: 222. 1929. La Esperanza, Volcán de Irazú, *Standley 35357*. Endemic.

**Peperomia exuberantifolia** Trelease, sp. nov.—Herba subparva stolonifera caespitosa erecta obscure puberula, caule 1–2 mm. crasso; folia vulgo ternata rotundo-elliptica et obtusissima, vel superiora ovata et subacuta, basi subacuta, 10–13 mm. longa 7–10 mm. lata, coriacea, 3- vel obscure 5-nervia, petiolo fere nullo; spicae terminales et ex axillis supremis 25 mm. longae 2 mm. crassae, serius graciliores et 60 mm. longae, pedunculo 5 mm. longo; bracteae rotundo-peltatae.—Cerro Central de Zurquí, Prov. Heredia, 1,600–1,700 meters, *Dodge, Thomas & Valerio 6140* p. p. in 1929 (type in Gray Herb.).

**Peperomia faucium-bovis** Trelease, sp. nov.—Herba majuscula diffusa vel scandens, caule 2 mm. crasso, internodiis longiusculis primo crispo-puberulis; folia alterna lanceolato-oblonga sensim caudata, basi paullo inaequilaterali subobtusa vel acuta, circiter 10 cm. longa 3–3.5 cm. lata, e medio inferiore pinnatinervia, nervis 5×2, utrinque puberula, nervis subtus breviter pubescentibus, petiolo 5–8 mm. longo crispo-puberulo; spicae solitariae (vel gemi-

natae?) ramulos sympodialiter terminales 1-foliatos terminantes, 40 mm. longae 2 mm. crassae, pedunculo vix 5 mm. longo.—Changuinola Valley, Bocas del Toro, Panama, near the Costa Rican boundary, *V. C. Dunlap 338* (type in Herb. Field Mus.).

**Peperomia filicaulis** C. DC. in Pittier, Prim. 2: 282. 1899. Puerto Viejo, Río Sarapiquí, *Biolley 7344*. Atlantic coast. Endemic.

**Peperomia filispica** C. DC. in Pittier, Prim. 2: 285. 1899. Alto de Ochomogo, *Pittier 10386*. Endemic.

**Peperomia fimbribractea** Trelease, Contr. U. S. Nat. Herb. 26: 196. 1929. Dulce Nombre, Prov. Cartago, *Standley 35897*. Region of Cartago; Los Ayotes, Guanacaste; 600–1,600 meters. Endemic.

**Peperomia fimbribractea** var. **sparsipila** Trelease, loc. cit. Cerro de Piedra Blanca, Prov. San José, *Standley 32469*.

**Peperomia fissispica** Trelease, Contr. U. S. Nat. Herb. 26: 201. 1929. Finca del Volcán de Turrialba, 2,000–2,400 meters, *Standley 35055*. Endemic.

**Peperomia flagellispica** Trelease, sp. nov.—Herba modica subrepens nigro-puncticulata arboricola, caule gracili 2 mm. crasso radicanti prope nodos inferiores plus minusve crispo-piloso; folia alterna lanceolata utrinque subaequaliter acuto-angustata, 4–5.5 cm. longa 1.5–2 cm. lata, palmatinervia, nervis interioribus supra basin confluentibus, sparsissime pilosa, petiolo 5–15 mm. longo plus minusve ciliato amplexicauli-decurrente; spicae terminales et axillares gracillimae longissimae, 150 mm. longae 1.5 mm. crassae, laxiflorae, pedunculo 2–3 cm. longo glabro; bracteae rotundo-peltatae; baccae ovoideae oblique apicatae, stigmate subapicali.—Farm One, Changuinola Valley, Bocas del Toro, Panama, near the Costa Rican boundary, *V. C. Dunlap 453* (type in U. S. Nat. Herb.; duplicate in Herb. Field Mus.).

**Peperomia fraijanesana** Trelease, Contr. U. S. Nat. Herb. 26: 202. 1929. Fraijanes, Prov. Alajuela, 1,500–1,700 meters, *Standley & Torres 47596*. Endemic.

**Peperomia fraijanesana** var. **subrhombica** Trelease, loc. cit. Fraijanes, *Standley & Torres 47602*.

**Peperomia fraijanesana** var. **san-isidroana** Trelease, loc. cit. Yerba Buena, above San Isidro, Prov. Heredia, 2,000 meters, *Standley & Valerio 50226*.

**Peperomia gallitoensis** Trelease, sp. nov.—Herba parva erecta compacte ramosa glabra, caule 1–2 mm. crasso, internodiis brevibus; folia opposita vel ternata lanceolato-elliptica subobtusa, basi acuta, circiter 10 mm. longa et 4 mm. lata, in sicco viridia, subopaca, vix plus quam 1-nervia, petiolo filiformi 3–4 mm. longo; inflorescentia? —El Gallito de Heredia, *Brenes 21744* (type in Herb. Field Mus.).

**Peperomia glaberrima** C. DC. in Pittier, Prim. 2: 289. 1899. *P. glabriramea* C. DC. Candollea 1: 370, 390. 1923. Santo Domingo de Golfo Dulce, *Tonduz 9943*. Also in Buenos Aires; region of San Ramón; Guanacaste. Endemic.

**Peperomia glabricaulis** C. DC. in Pittier, Prim. 2: 290. 1899. Forests of Tsuritkub, Talamanca, *Tonduz 8689*. Endemic.

**Peperomia gleicheniaeformis** Trelease, sp. nov.—Herba parva essentialiter glabra stolonifera, caulibus geniculato-flexuosis cito divaricato-dichotomis vix 1 mm. crassis; folia alterna elliptica atque 10 mm. longa et 5 mm. lata, vel anguste lanceolata, 20 mm. longa, 8 mm. lata, utrinque acuta, 3-nervia, in sicco firma, petiolo 2–3 mm. longo; spicae terminales 25 mm. longae 1 mm. crassae, pseudopedicellis conicis, pedunculo gracili 5 mm. longo; bracteae rotundo-peltatae; baccae subglobosae, stigmate obliquo.—El General, Prov. San José, 1,010 meters, *A. F. Skutch 2287* (type in U. S. Nat. Herb.).

**Peperomia guayabillosana** Trelease in Cufodontis, Archivio Bot. 10: 2. 1934. Southwestern slopes of Volcán de Irazú, near Guayabillos, 2,300 meters, *Cufodontis 317*. Endemic. Related to *P. Pittieri*.

**Peperomia guanacastana** Trelease, Contr. U. S. Nat. Herb. 26: 220. 1929. El Arenal, Prov. Guanacaste, 485–600 meters, *Standley & Valerio 45065*. Endemic; known only from the region of the type.

**Peperomia guapilesana** Trelease, Contr. U. S. Nat. Herb. 26: 210. 1929. Guápiles, 300–500 meters, *Standley 37446*. Endemic.

**Peperomia herediana** Trelease, Contr. U. S. Nat. Herb. 26: 197. 1929. Yerba Buena, Prov. Heredia, 2,000 meters, *Standley & Valerio 49260*. Slopes of Volcán de Barba. Endemic.

**Peperomia Hoffmannii** C. DC. Journ. Bot. 4: 133. 1866. *Elotillo*. San José, *Hoffmann 415*. Abundant in the Meseta Central and on the slopes of the volcanoes; region of San Ramón. Endemic.

**Peperomia hylophila** C. DC. in Pittier, Prim. 2: 284. 1899. *P. irazuana* C. DC. op. cit. 293 (Irazú, *Tonduz 4408*). La Carpintera, Prov. Cartago, *Pittier 4406*. Slopes of the mountains of the central region. Endemic.

**Peperomia hylophila** var. **personata** Trelease, Contr. U. S. Nat. Herb. 26: 203. 1929. Volcán de Poás, 2,300 meters, *J. D. Smith 6744*. Also at La Palma de San José.

**Peperomia imbricata** Trelease, Contr. U. S. Nat. Herb. 26: 224. 1929. El Infiernillo, Juan Viñas, Prov. Cartago, *Pittier 3178*. Endemic.

**Peperomia incisa** Trelease, Contr. U. S. Nat. Herb. 26: 205. 1929. Quebrada Serena near Tilarán, Guanacaste, 700 meters, *Standley & Valerio 46318*. Endemic.

**Peperomia incrassata** Trelease, sp. nov.—Herba valida rhizomatosa majuscula glabra, *P. psilocladae* affinis, caule 2–3 mm. crasso; folia alterna elliptica utrinque subaequaliter acutata, 3.5–5.5 cm. longa 1.5–3 cm. lata, 5-nervia, nervis interioribus aliquanto confluentibus, in sicco opaca fuscescentia, petiolo 5–7 mm. longo; spicae terminales 70 mm. longae 2 mm. crassae, pedunculo crassiusculo 10 mm. longo; bracteae rotundo-peltatae; baccae subglobosae oblique apiculatae, stigmate subapicali.—El Tablazo, Prov. San José, 1,800 meters, *Manuel Valerio 1120* (type in Herb. Field Mus.).

**Peperomia isidroana** Trelease, Contr. U. S. Nat. Herb. 26: 215. 1929. Yerba Buena, above San Isidro, Prov. Heredia, 2,000 meters, *Standley & Valerio 50232*. Endemic.

**Peperomia jarisiana** C. DC. Linnaea 37: 382. 1872. Volcán de Jarís, *Oersted*. Palmira del Naranjo, at 1,850 meters. Endemic.

**Peperomia jimenezana** (C. DC.) Trelease, Contr. U. S. Nat. Herb. 26: 196. 1929. *P. caulibarbis* var. *jimenesana* C. DC. in Pittier, Prim. 2: 284. 1899. *P. glabella* var. *barbulata* C. DC. Candollea 1: 325. 1923; 3: 125. 1926 (Agua Dulce, *Pittier 11034*). Jiménez, Llanuras de Santa Clara, *J. D. Smith 4929*. Frequent in the tierra caliente, ascending the slopes of volcanoes to 1,800 meters. Endemic. Reported from Costa Rica as *P. melanostigma* Miq.

**Peperomia lagartana** C. DC. in Pittier, Prim. 2: 285. 1899. Between Boruca and Lagarto, Prov. Puntarenas, *Tonduz 4660*. Endemic.

**Peperomia lancilimba** C. DC. Candollea 1: 290, 394. 1923. Volcán de Barba, *Hoffmann 61*. Mountains of the Meseta Central. Endemic.

**Peperomia Lankesteri** Trelease, sp. nov.—Herba epiphytica parvula stolonifera glabra, caule aliquanto ramoso 1–2 mm. crasso in sicco sulcato; folia alterna rotundo-obovata plerumque basi acuta, 10 mm. longa 8 mm. lata, plus minusve conspicue 3-nervia, in sicco coriacea, petiolo 3–5 mm. longo; spicae terminales et ex axillis superioribus nascentes 10–12 mm. longae 2 mm. crassae, pedunculo vix 5 mm. longo; bracteae rotundo-peltatae in sicco coriaceae; baccae globosae, stigmate obliquo sessili.—Pejivalle, *C. H. Lankester 1294* (type in Herb. Field Mus.).

**Peperomia late-ovata** Trelease, Contr. U. S. Nat. Herb. 26: 191. 1929. Laguna de La Chonta, near Santa María de Dota, 2,000 meters, *Standley 42310*. Collected also near San José. Endemic.

**Peperomia lignescens** C. DC. Journ. Bot. 4: 137. 1866. Type collected by Hoffmann, without definite locality. Collected also at Térraba and El General. Endemic.

**Peperomia lignescens** var. **carthaginensis** (C. DC.) Trelease, Contr. U. S. Nat. Herb. 26: 193. 1929. *P. carthaginensis* C. DC. Linnaea 37: 377. 1872. Cartago, *Oersted 925*. Frequent in the central region; region of San Ramón.

**Peperomia lignescens** var. **subcuneilimba** Trelease, loc. cit. Santa María de Dota, 1,500–1,800 meters, *Standley 41564*.

**Peperomia longibacca** C. DC. Candollea 1: 369. 1923; 2: 188. 1925. Nicoya, *Tonduz 13958*. Collected also at Cabagra and Tilarán. Endemic.

**Peperomia longibacca** C. DC. Candollea 1: 313. 1923. Santa Rosa de Copey, *Tonduz 12243*. Cantón de Dota and Meseta Central. Endemic. Listed by some authors under the name of *P. penicillata* var. *magnifolia*.

**Peperomia martagonifolia** C. DC. Ann. Cons. Jard. Genève 21: 262. 1920, nomen; Candollea 1: 313. 1923; 2: 188. 1925; Schroeder, Candollea 3: 128. 1926. Santa Rosa de Copey, Prov. San José, *Tonduz 12243*. Cabagra; region of Dota; Meseta Central. Endemic. Reported from Costa Rica under the name *P. penicillata* var. *magnifolia*.

**Peperomia martagonifolia** var. **contempta** Trelease, Contr. U. S. Nat. Herb. 26: 218. 1929. San José, *Pittier 4249*. Atlantic slope, descending to Tucurrique. Endemic.

**Peperomia martagonifolia** var. **Wercklei** (C. DC.) Trelease, op. cit. 219. *P. Wercklei* C. DC. Candollea 1: 306. 1923. San Cristóbal de Candelaria, *Wercklé 3688*.

**Peperomia martagonifolia** var. **Torresana** Trelease, loc. cit. Fraijanes, Prov. Alajuela, 1,600 meters, *Standley & Torres 47624*.

**Peperomia megalanthera** Trelease, Contr. U. S. Nat. Herb. 26: 206. 1929. La Hondura, Prov. San José, 1,300–1,700 meters, *Standley 37970*. Endemic.

**Peperomia mentiens** Trelease, Contr. U. S. Nat. Herb. 26: 217. 1929. Río Turrialba, Prov. Cartago, 500 meters, *J. D. Smith 4926B*. Atlantic coast, ascending to Pejivalle (900 meters). Endemic.

**Peperomia mentiens** var. **lata** Trelease, loc. cit. Finca Montecristo, Río Reventazón, *Standley & Valerio 49012*.

**Peperomia montecristana** Trelease, Contr. U. S. Nat. Herb. 26: 199. 1929. Finca Montecristo, Río Reventazón, *Standley & Valerio 49017*. Endemic.

**Peperomia multifida** Trelease, Contr. U. S. Nat. Herb. 26: 201. 1929. Cerro de La Carpintera, Prov. Cartago, 1,500 meters, *Standley 34349*. Also at Las Nubes. Endemic.

**Peperomia munyecoana** Trelease, Contr. U. S. Nat. Herb. 26: 197. 1929. El Muñeco, Prov. Cartago, 1,400 meters, *Standley & Torres 51754*. Collected also at Pejivalle, 900 meters. Endemic.

**Peperomia muscisedens** C. DC. Candollea 1: 398. 1923. *P. muscicola* C. DC. Candollea 1: 298, 398. 1923, non Ridl. Las Vueltas, Prov. Cartago, *Tonduz 13135*. Endemic.

**Peperomia naranjoana** C. DC. Linnaea 37: 378. 1872. Naranjo, *Oersted 974*. Endemic.

**Peperomia navarrana** Trelease, Contr. U. S. Nat. Herb. 26: 215. 1929. El Muñeco, Río Navarro, Prov. Cartago, 1,400 meters, *Standley 33553*. Endemic.

**Peperomia nemoralis** C. DC. in Pittier, Prim. 2: 292. 1899. Shirores, Talamanca, *Tonduz 9268*. Collected also at Tsaki. Endemic.

**Peperomia nicoyana** C. DC. Candollea 1: 341. 399. 1923. Nicoya, *Tonduz 13692*. Endemic.

**Peperomia niveo-punctulata** Trelease, Contr. U. S. Nat. Herb. 26: 199. 1929. Guápiles, 300–500 meters, *Standley 37552*. Endemic.

**Peperomia oblongifolia** C. DC. Candollea 1: 299. 400. 1923. Quebrada Honda, Juan Viñas, Prov. Cartago, *Pittier 10419*. Also at Alto de Ochomogo. Endemic.

**Peperomia Oerstedii** C. DC. Linnaea 37: 375. 1872. Volcán de Irazú, *Oersted 977*. Cantón de Dota. Endemic.

**Peperomia olivacea** C. DC. Journ. Bot. 4: 146. 1866. San José, *Hoffmann 810*. Endemic.

**Peperomia olivacea** var. **perlongispica** Trelease, Contr. U. S. Nat. Herb. 26: 21. 1929. Quebradillas, near Santa María de Dota, 1,800 meters, *Standley 43368*. Frequent in Dota and the Meseta Central. Endemic.

**Peperomia orientalis** Trelease, Contr. U. S. Nat. Herb. 26: 211. 1929. Finca La Colombiana, Prov. Limón, *Standley 36943*. A common species of the Atlantic coast. Endemic.

**Peperomia osana** Trelease, sp. nov.—Herba majuscula repens aliquanto pubescens, aspectu *P. scandenti* similis, caule 1–2 mm. crasso; folia alterna deltoideo-ovata acute acutata 1.5–2 cm. diam. 5-nervia, petiolo 1–2 cm. longo; spicae terminales 25 mm. longae 2 mm. crassae, pedunculis aliquanto brevioribus prope medium bracteatis; baccae anguste oblongae rostellatae, stigmatibus basi rostri obliquis.—Río Sándalo, Península de Osa, Prov. Puntarenas, at sea level, *Dodge & Goerger 10079* (type in herb. Mo. Bot. Gard.), *9958*.

**Peperomia Otoni** Trelease, sp. nov.—Herba majuscula late repens et radicans glabra, caule 2 mm. crasso; folia alterna lanceolato-ovata sensim longiacuminata, 1 cm. supra basin rotundatam peltata, 6–8 cm. longa 2.5–3.5 cm. lata, circiter 7-nervia, nervis interioribus inferne aliquanto confluentibus, in sicco tenuia sed subopaca, petiolo 3–4 cm. longo; spicae sympodialiter geminatae scapum 1-bracteatum 5 vel 10–25 mm. longum terminantes, in statu juvenili 20 mm. longae 2 mm. crassae, pedunculo vix 5 mm. longo; bracteae minutae rotundo-peltatae.—Hacienda Santa María, Guanacaste, 720–850 meters, *C. W. Dodge, Otón Jiménez & W. S. Thomas 7768* in 1930 (type in Gray Herb.).

**Peperomia pachyphlebia** Trelease, Contr. U. S. Nat. Herb. 26: 216. 1929. La Palma, Prov. San José, 1,450 meters, *Tonduz 12606*. Collected also at Candelaria. Endemic.

**Peperomia palmae** Trelease, sp. nov.—Herba modica (vel majuscula?) rhizomatosa glabra, caule 3–4 mm. crasso; folia alterna elliptico-subobovata obtusa et subemarginata, basi acuta, 6 cm. longa 4–4.5 cm. lata, e medio inferiore pinnatinervia, nervis salientibus circiter 5×2, in sicco coriacea, supra roseo tincta, subtus pallidiora, petiolo 2–3 cm. longo; spicae subterminales solitariae 40 mm. longae 3 mm. crassae, pedunculo 6 cm. longo medio 1-bracteato.—Alto de La Palma near San Ramón, 1,325 meters, *Brenes 3792* (type in Herb. Field Mus.). La Palma de San Ramón, *Brenes 20597*.

**Peperomia palmana** C. DC. Bull. Soc. Bot. Belg. 29, pt. 2: 71. 1890. *P. palmana* var. *oppositifolia* C. DC. Anal. Inst. Costa Rica 9: 180. 1897. La Palma, Prov. San José, *Pittier 724*. Abundant in the mountains of the central region. Endemic.

**Peperomia palmana** var, **fragrans** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 233. 1891. Volcán de Turrialba, *Lehmann 1105*.

**Peperomia palmana** var. **oxystachya** (C. DC.) Trelease, Contr. U. S. Nat. Herb. 26: 221. 1929. *P. oxystachya* C. DC. Anal. Inst. Costa Rica 9: 180. 1897. El Tablazo, Prov. San José, *Tonduz 8041*. Frequent on the slopes of Volcán Poás.

**Peperomia palmana** var. **pseudo-oxystachya** Trelease, loc. cit. Yerba Buena, Prov. Heredia, 2,000 meters, *Standley & Valerio 49222*.

**Peperomia palmana** var. **Valerionum** Trelease, var. nov.—Glabrata, foliis var. *oxystachyae* similis, foliis vulgo 3–4-natis; spicae ad anthesin breves obtusae 20 mm. longae 1 mm. crassae, pedunculo 5 mm. longo.—Cerro Central de Zurquí, Prov. Heredia, 1,600–1,700 meters, *Dodge, Thomas, Juvenal Valerio & Remo Valerio 6146* in 1929 (type in Gray Herb.).

**Peperomia palmensis** Trelease, sp. nov.—Herba modice parva cito erecta glabra epiphytica, caulibus sursum gracillimis, basin versus 3 mm. crassis; folia alterna obovata apice rotundata et emarginata, basi acuta, 2.5–3.5 cm. longa 2–3 cm. lata, salienter pinnatinervia, nervis majoribus 3×2 prope basin costae, in sicco opaca coriacea, petiolo circiter 5 mm. longo; spicae axillares et solitariae vel 2–3 scapum gracilem terminalem vix 2 cm. longum

terminantes, filiformes, 40–50 mm. longae, pedunculo 1–3 cm. longo filiformi.—La Palma de San Ramón, 1,100 meters, *Brenes 5509* (type in Herb. Field Mus.).

**Peperomia parmata** Trelease, Contr. U. S. Nat. Herb. 26: 212. 1929. Río Turrialba, Prov. Cartago, 500 meters, *J. D. Smith 4926*. Slopes of the volcanoes, and Atlantic watershed, 500–1,600 meters; Cantón de Dota. Endemic. Reported for Costa Rica under the names *P. variegata* and *P. maculosa*.

**Peperomia pellucida** (L). HBK. Frequent on the Atlantic coast, ascending to the slopes of Irazú. A terrestrial annual, common about settlements, growing sometimes in cultivated ground. A species of wide distribution in America.

**Peperomia peltilimba** C. DC. ex Trelease, Bot. Gaz. 13: 145. 1922. San Ramón, Prov. Alajuela, *Brenes 14178*. La Hondura de San José; El Muñeco; Pejivalle. Endemic.

**Peperomia peninsularis** Trelease, Contr. U. S. Nat. Herb. 26: 216. 1929. Nicoya, *Tonduz 13694*. Endemic. Listed for Costa Rica as *P. obtusifolia* Dietr.

**Peperomia pilulifera** Trelease, Contr. U. S. Nat. Herb. 26: 199. 1929. Guápiles, 300–500 meters, *Standley 37439*. Endemic.

**Peperomia pirrisana** Trelease, Contr. U. S. Nat. Herb. 26: 223. 1929. Pozo Azul de Pirrís, *Lankester 1166*. Endemic.

**Peperomia Pittieri** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 235. 1891. La Palma, Prov. San José, *Pittier 722*. Frequent on the slopes of the volcanoes; region of San Ramón. Endemic.

**Peperomia platyphylla** C. DC. Candollea 1: 368, 403. 1923. Juan Viñas, Prov. Cartago, *Cook & Doyle 269*. Collected also at La Hondura de San José. Endemic.

**Peperomia poasana** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 224. 1891. Volcán de Poás, *Pittier 63*. Collected also at La Estrella de Cartago and La Palma de San José; frequent in the region of San Ramón, at 1,000–1,400 meters.

**Peperomia poasana** var. **herediana** Trelease, Contr. U. S. Nat. Herb. 26: 208. 1929. Yerba Buena above San Isidro, Prov. Heredia, 2,000 meters, *Standley & Valerio 50197*. Slopes of Volcán de Barba. Endemic.

**Peperomia podocarpa** C. DC. in Pittier, Prim. 2: 280. 1899. El General, *Pittier 10595*. Endemic.

**Peperomia Porschiana** Trelease, Archivio Bot. 10: 3. 1934. Volcán Poás, 2,200–2,400 meters, *Cufodontis 737*. Related to *P. hylophila*. Endemic.

**Peperomia pothifolia** Trelease, Contr. U. S. Nat. Herb. 26: 210. 1929. Guápiles, 300–500 meters, *Standley 37427*. Endemic.

**Peperomia pseudo-alpina** Trelease, Contr. U. S. Nat. Herb. 26: 217. 1929. Colinas de Piedades, San Ramón, Prov. Alajuela, 1,100 meters, *Brenes 14180*. Frequent in mountains of the central region. Endemic. Reported for Costa Rica under the name *P. magnoliifolia* var. *parvifolia*.

**Peperomia pseudo-Casaretti** C. DC. Anal. Inst. Costa Rica 9: 179. 1897. Shirores, *Tonduz 9282*. Tierra caliente of both coasts, ascending to 1,400 meters. Endemic. Reported from Costa Rica as *P. scandens* R. & P.

**Peperomia pseudo-Hoffmannii** Trelease, Contr. U. S. Nat. Herb. 26: 225. 1929. *Garrapatilla*. Finca La Colombiana, Prov. Limón, *Standley 36837*. Endemic.

**Peperomia pseudo-Hoffmannii** var. **lenticularis** Trelease, loc. cit. Finca La Colombiana, *Standley 36837*.

**Peperomia pseudopedicellata** Trelease, Contr. U. S. Nat. Herb. 26: 198. 1929. La Hondura, Prov. San José, 1,300–1,700 meters, *Standley 37762*. Endemic.

**Peperomia pseudo-tetraphylla** Trelease, Contr. U. S. Nat. Herb. 26: 224. 1929. Finca Las Cóncavas, Prov. Cartago, 1,200 meters, *Standley 41488*. Regions of Cartago and Cantón de Dota, ascending to 2,000 meters. Endemic.

**Peperomia pseudo-tetraphylla** var. **Dodgei** Trelease, var. nov.—Herba parva repenti-adsurgens simplex glabra; folia obovata emarginulata basi acuta 13 mm. longa 6 mm. lata, in sicco coriacea, subtus subpapillosa.—Finca Coliblanco, southern slope of Volcán de Turrialba, 1,980 meters, *C. W. Dodge 4715* (type in Gray Herb.).

**Peperomia pseudo-tetraphylla** var. **Juvenalis** Trelease, loc. cit. Cerro de Las Vueltas, 3,000 meters, *Standley & Valerio 44003*.

**Peperomia psiloclada** C. DC. Anal. Inst. Costa Rica 9: 176. 1897. *Elotillo, Hilotillo*. *P. psiloclada* var. *magnifolia* C. DC.

Candollea 1: 350. 1923 (Santa Rosa del Copey, *Tonduz 12222*). El Tablazo, *Pittier 8040*. Common in mountains of the central region, ascending to 2,000 meters; region of San Ramón. Endemic.

**Peperomia punctatifolia** Trelease, Contr. U. S. Nat. Herb. 26: 204. 1929. La Hondura, Prov. San José, 1,300–1,700 meters, *Standley 37968*. Mountains of the central region, also at Guápiles. Endemic.

**Peperomia punctatifolia** var. **munyecoana** Trelease, loc. cit. El Muñeco, Prov. Cartago, 1,400 meters, *Standley 33432*.

**Peperomia pyrolifolia** Trelease, Contr. U. S. Nat. Herb. 26: 217. 1929. Limón, *Pittier 12691*. Endemic.

**Peperomia queserana** Trelease, Contr. U. S. Nat. Herb. 26: 210. 1929. La Quesera, Roble de Copey, Prov. San José, 2,700 meters, *Tonduz 12184*. Slopes of the volcanoes and in El General. Endemic. Listed from Costa Rica as *P. adscendens* C. DC.

**Peperomia rata** Trelease, sp. nov.—Herba majuscula glabra, ramis gracilibus; folia vulgo 3–5-verticillata, inferiora lanceolata, 6 cm. longa 2 cm. lata, superiora sensim minora 2–3 cm. longa 1 cm. lata, utrinque acuta vel superiora subacuminata et basi subobtusa, 3-nervia vel obscure 5-nervia, in sicco viridia, petiolo 2 mm. vel foliorum majorum 5 mm. longo; spicae terminales et ex axillis superioribus nascentes filiformes vix 25 mm. longae, pedunculo vix 5 mm. longo.—El General, Prov. San José, 850 meters, *A. F. Skutch 2675* (type in U. S. Nat. Herb.).

**Peperomia redondoana** Trelease, sp. nov.—Herba parva stolonifero-erecta ramosa, caule 1–3 mm. crasso transiente sparse hirtello furfuraceo-exfoliante; folia vulgo 4–5-nata elliptico-obovata obtusa, basi subacuta, 5–8 mm. longa 3–4 mm. lata, coriacea et non manifeste nervosa, petiolo 1 mm. longo; spicae terminales 30–50 mm. longae 2 mm. crassae, pedunculo 5–10 mm. longo; bracteae rotundo-peltatae.—Potrero at Rancho Redondo, Prov. San José, 2,220–2,600 meters, *Dodge & Thomas 5423* in 1929 (type in Gray Herb.).

**Peperomia reflexifolia** Trelease, Contr. U. S. Nat. Herb. 26: 223. 1929. *Garrapatilla*. *P. reflexa* var. *angustifolia* C. DC. Anal. Inst. Costa Rica 9: 180. 1897. La Esmeralda, Volcán de Barba, *Biolley & Pittier 7259*. Frequent in mountains of the whole central region. Endemic. Pittier states that the crushed leaves are applied as poultices to reduce the inflammation of sores and wounds.

**Peperomia rejecta** Trelease, Contr. U. S. Nat. Herb. 26: 205. 1929. Yerba Buena, above San Isidro, Prov. Heredia, 2,000 meters, *Standley & Valerio 50219*. Endemic.

**Peperomia reptabunda** Trelease, Contr. U. S. Nat. Herb. 26: 206. 1929. Las Vueltas, Tucurrique, Prov. Cartago, 635 meters, *Tonduz 12971*. Endemic.

**Peperomia rio-albae** Trelease, sp. nov.—Herba parva dichotoma caespitosa, caule 1 mm. crasso nodoso, internodiis brevibus; folia vulgo 4–5-nata obovata saepe emarginulata, basi acuta, 6–7 mm. longa 4 mm. lata, in sicco coriacea, vix 1-nervia, petiolo 1–2 mm. longo; spicae terminales, juveniles 10 mm. longae 1 mm. crassae, pedunculo filiformi vix 10 mm. longo; bracteae rotundo-peltatae dense insertae.—Río Alba, El Copey, above 1,800 meters, *H. E. Stork 2986* (type in herb. Univ. Illinois).

**Peperomia rio-poasensis** Trelease, sp. nov.—Herba modica glabra, caule 3 mm. crasso, internodiis brevibus; folia alterna ovata vel rotundo-ovata obtusa, basi breviter cordata, 5–7 cm. longa 3–6 cm. lata, 7–9-nervia, in sicco tenuia translucentia, petiolo gracili 3–7 cm. longo; spicae axillares solitariae vel geminatae et scapum brevem parvibracteatum terminantes, 50 mm. longae 2 mm. crassae, pedunculo vix 10 mm. longo; bracteae rotundo-peltatae; ovarium subglobosum.—Carrillo de Poás, near Río Poás, *Brenes 19369* (type in Herb. Field Mus.).

**Peperomia rio-poasensis** var. **subacaulescens** Trelease, var. nov.—Caulis ut videtur non evolutus; petiolus 10 cm. longus; spicae 90 mm. longae, bractea fulcrante 15 mm. longa 10 mm. lata.—With the type, near Río Poás, *Brenes 17246* (type in Herb. Field Mus.), *17247*.

**Peperomia rotundifolia** (L.) HBK. *P. nummularifolia* HBK. An abundant plant in the mountains and in the tierra caliente. A species of wide distribution in America.

**Peperomia saltivagans** Trelease, sp. nov.—Herba parva repens glabra, ramis fertilibus brevibus paucifoliatis erectis, caule filiformi; folia alterna late ovata obtusa, basi subacuta, 10 mm. longa 6 mm. lata, opaca et vix plus quam 1-nervia, petiolo 1–2 mm. longo; spicae terminales, juveniles 10 mm. longae 1 mm. crassae, pedunculo 5 mm. longo.—In forest, Finca Castilla, Prov. Limón, 30 meters, *Dodge & Goerger 9281* (type in herb. Mo. Bot. Gard.).

**Peperomia san-joseana** C. DC. Linnaea 37: 372. 1872. San José, *Oersted 952*. Frequent in the Meseta Central and on slopes of the volcanoes; San Ramón. Endemic.

**Peperomia san-pedroana** Trelease, sp. nov.—Herba parva stolonifera glabra inter muscos repens, ramis brevibus, caule 1 mm. crasso; folia alterna sed superne internodiis brevissimis separata, elliptica circiter 10–12 mm. longa et 8 mm lata utrinque obtusa, plus minusve conspicue trinervia, petiolo 2–5 mm. longo; spicae axillares vix 10 mm. longae 1.5 mm. crassae, pedunculo 5 mm. longo. —Colinas de San Pedro de San Ramón, *Brenes 19126* (type in Herb. Field Mus.).

**Peperomia san-ramonensis** C. DC. Candollea 1: 332, 408. 1923. Santiago, San Ramón, *Brenes 14183*. Endemic.

**Peperomia santanana** Trelease, sp. nov.—Herba majuscula sed delicatissima pauciramosa glabrata, caule in sicco 2 vel basin versus 5 mm. crasso tenerrimo, ramis 1–2-foliatis; folia alterna rhombea obtuse subacuminata, basi cuneata, 5.5–6 cm. longa 4–4.5 cm. lata (ramealia vix 2.5 cm. longa et lata atque basi obtusa), in sicco tenerrima translucentia graciliter 5-nervia venosa, praesertim apicem versus ciliata, petiolo 2–3 cm. longo (foliorum ramealium 5 mm. tantum longo); spicae terminales filiformes 120 mm. longae laxiflorae, pedunculo 2–3 cm. longo; baccae ellipsoideae breviter apiculatae, stigmatibus obliquis.—In potrero, Finca Santana, Prov. San José, *Dodge & Goerger 10476* (type in herb. Mo. Bot. Gard.).

**Peperomia sciaphila** C. DC. Anal. Inst. Costa Rica 9: 175. 1897. *P. schizostachya* Trel. Bot. Gaz. 73: 138. 1922. Río Virilla, San José, *Tonduz 9630*. Meseta Central. Endemic. Reported from Costa Rica as *P. ovato-peltata* C. DC.

**Peperomia scutellata** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 230. 1891. Alto de La División, *Pittier 3611*. La Concepción, Llanuras de Santa Clara. Endemic.

**Peperomia sepicola** Trelease, Contr. U. S. Nat. Herb. 26: 225. 1929. San Ramón, Prov. Alajuela, *Tonduz 17790*. Endemic.

**Peperomia sessilifolioides** C. DC. Candollea 1: 409. 1923. *P. sessilifolia* C. DC. Candollea 1: 290. 1923, non HBK. Río Naranjo, *Pittier 7835*. Endemic.

**Peperomia silvivaga** C. DC. Anal. Inst. Costa Rica 9: 177. 1897. Forests of Turrialba, 570 meters, *Tonduz & Pittier 8435*. Endemic. Reported under the name *P. serpens* C. DC.

**Peperomia Solisii** Trelease, sp. nov.—Herba majuscula repens radicans glabra, caule 2–4 mm. crasso; folia alterna rotundo-obovata obtusa et subemarginulata, basi acuta, 2.5–3.5 cm. longa 2.5–3 cm. lata, e medio inferiore pinnatinervia, nervis circiter 4×2, in sicco coriacea, supra opaca venosa, subtus flavescentia, petiolo 5–10 mm. longo; inflorescentia?—Piedra Blanca, Escasú, 1,900 meters, January, 1935, *Fernando Solis 171* (type in Herb. Field Mus.).

**Peperomia sphagnicola** Trelease, sp. nov.—Herba modice parva stolonifero-erecta simplex glabra, caule 1–2 mm. crasso; folia alterna elliptica basi acuta, apice emarginulato subacuto, 12–20 mm. longa 8–12 mm. lata, in sicco opaca, supra viridia, subtus brunnescentia, obscure trinervia, costa supra profunde impressa, petiolo 5 mm. longo amplexicauli-decurrente; spicae terminales 50–60 mm. longae 2 mm. crassae, pedunculo ad 15 mm. longo; baccae griseae subellipsoideae, inferne angustatae, pseudopedicellos aequilongos rigidos terminantes, stigmate terminali.—In sphagnum, El General, Prov. San José, 1,890 meters, *A. F. Skutch 3047* (type in U. S. Nat. Herb.).

**Peperomia stenophylla** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 228. 1891. El General, *Pittier 3398*. Endemic.

**Peperomia stenophylla** var. **paradendrophila** Trelease, Contr. U. S. Nat. Herb. 26: 201. 1929. Tuis, Prov. Cartago, 650 meters, *Tonduz 11531*.

**Peperomia stenophyllopsis** Trelease, Contr. U. S. Nat. Herb. 26: 201. 1929. Fraijanes, Prov. Alajuela, 1,500–1,700 meters, *Standley & Torres 47590*.

**Peperomia stipitifolia** Trelease, Contr. U. S. Nat. Herb. 26: 220. 1929. Cerro de Las Vueltas, 3,000 meters, *Standley & Valerio 44013*. Cantón de Dota. Endemic.

**Peperomia Storkii** Trelease, sp. nov.—Herba parvula patens glabra epiphytica, caule vix 1 mm. crasso; folia alterna elliptica breviter acuminata, basi acuta, 3.5–4 cm. longa 1.5–2 cm. lata, tenuiter 3-nervia atque venulosa, in sicco tenerrima, petiolo 5–10 mm. longo; spicae terminales et sympodiales, circiter 30 mm. longae 1 mm. crassae, pedunculo 5 mm. longo; bracteae rotundo-peltatae.—Cerro de La Carpintera, 1,710 meters, *H. E. Stork 1171* (type in herb. Univ. Illinois).

**Peperomia subacaulis** Trelease, Contr. U. S. Nat. Herb. 26: 209. 1929. Suerre, Llanuras de Santa Clara, 300 meters, *J. D.*

*Smith 6748*. Collected also at Guápiles. Endemic. Reported from Costa Rica under the name *P. longifolia* C. DC.

**Peperomia subdita** Trelease, Contr. U. S. Nat. Herb. 26: 194. 1929. La Estrella, Prov. Cartago, 1,300 meters, *Cooper 192*. Region of Cartago. Endemic.

**Peperomia subemarginulata** (C. DC.) Trelease, Contr. U. S. Nat. Herb. 26: 223. 1929. *P. reflexa* var. *subemarginulata* C. DC. in DC. Prodr. 16, pt. 1: 452. 1869. Cerro de Candelaria, *Hoffmann 21*. Meseta Central and Cantón de Dota. Endemic.

**Peperomia substriata** C. DC. Candollea 1: 291, 411. 1923. La Palma, Prov. San José, *Tonduz 12473*. Also Volcán de Irazú. Endemic.

**Peperomia substrigosa** Trelease, sp. nov.—Herba modica stolonifero-erecta sparse ramosa, axibus aliquanto strigosis, caule basin versus 3 mm. crasso; folia ad nodum circiter 3 lanceolata subacuta, basi acuta, 3–4 cm. longa 1 cm. lata, obscure circiter 3-nervia, petiolo filiformi 5–8 mm. longo; spicae terminales et ex axillis supremis nascentes filiformes circiter 40 mm. longae, pedunculo fere 30 mm. longo.—La Palma de San Ramón, 1,050 meters, *Brenes 5612* (type in Herb. Field Mus.).

**Peperomia tecticola** C. DC. Anal. Inst. Costa Rica 9: 175. 1897. San José, *Tonduz 7262*. Meseta Central. Endemic.

**Peperomia tecticola** var. **muricola** Trelease, Bot. Gaz. 73: 143. *pl. 3*. 1922. San Juan, *Tonduz 10146*. Meseta Central. Reported as *P. lanceolato-peltata*.

**Peperomia tecticola** var. **tilirina** Trelease, Contr. U. S. Nat. Herb. 26: 193. 1929. Río Tilirí, Prov. San José, *Tonduz 3208*. Reported as *P. puberula* Baker.

**Peperomia tenelliformis** Trelease, Contr. U. S. Nat. Herb. 26: 203. 1929. La Palma, Prov. San José, 1,600 meters, *Standley 33135*. Endemic.

**Peperomia tenuicaulis** C. DC. Anal. Inst. Costa Rica 9: 177. 1897. Santo Domingo de Golfo Dulce, *Pittier 9986*. Endemic.

**Peperomia tenuifolia** C. DC. Linnaea 37: 371. 1872. Cerro de Aguacate, Prov. Alajuela, *Oersted 1001*. Endemic.

**Peperomia tenuinervis** Trelease, sp. nov.—Herba majuscula repenti-adsurgens glabra, caule 1–2 mm. crasso; folia alterna vel

suprema congesto-subverticillata elliptico-oblanceolata acute acuminata basi cuneata 4–6.5 cm. longa 2–3 cm. lata, graciliter pinnatim paucinervia, in sicco lutescentia opaca, petiolo 1.5–3 cm. longo gracili; spicae terminales 60–70 mm. longae 3 mm. crassae, pedunculo 20 mm. longo; bracteae rotundo-peltatae.—El General, Prov. San José, 975 meters, *A. F. Skutch 2199* (type in U. S. Nat. Herb.).

**Peperomia tenuipes** Trelease, Contr. U. S. Nat. Herb. 26: 192. 1929. Cerro de Las Caricias, above San Isidro, Prov. Heredia, *Pittier 14042*. Endemic.

**Peperomia tilarana** Trelease, Contr. U. S. Nat. Herb. 26: 211. 1929. Tilarán, Guanacaste, 600 meters, *Standley & Valerio 44217*. Endemic.

**Peperomia Tonduzii** C. DC. Bull. Soc. Bot. Belg. 29, pt. 2: 70. 1890. Volcán de Barba, *Pittier 566*. Also Cantón de Dota. Endemic.

**Peperomia translucens** Trelease, sp. nov.—Herba parva simplex erecta delicata glabra, caule filiformi; folia alterna rotundo-ovata subabrupte obtuso-acuminata, basi minute cordulata, 15 mm. diam., in sicco tenerrima delicate 5-nervia cellulose fusco-punctulata, petiolo 10 mm. longo; spicae terminales vel ex axillis supremis nascentes filiformes 20 mm. longae laxiflorae, pedunculo 5–10 mm. longo; baccae ovoideae rare stipitatae, stylo brevi, stigmate apicali. —In forest, Finca Castilla, Prov. Limón, 30 meters, *Dodge & Goerger 9292* (type in herb. Mo. Bot. Gard.).

**Peperomia tremendalensis** Trelease, Contr. U. S. Nat. Herb. 26: 216. 1929. Colinas de Tremendal, San Ramón, Prov. Alajuela, *Tonduz 17788*. Region of San Ramón and slopes of Barba. Endemic.

**Peperomia tsakiana** C. DC. Anal. Inst. Costa Rica 9: 178. 1897. Talamanca, *Tonduz 9540*. Collected also at Tsaki. Endemic.

**Peperomia tsakiana** var. **victoriana** C. DC. ex Trelease, Contr. U. S. Nat. Herb. 26: 213. 1929. Victoria, Zent, *Pittier 16085*.

**Peperomia tuisana** C. DC. Anal. Inst. Costa Rica 9: 176. 1897. Tuis, Prov. Cartago, *Tonduz 8222*. Endemic.

**Peperomia turialvensis** C. DC. Linnaea 37: 380. 1872. Turrialba, *Oersted 1003;* region of San Ramón. Endemic.

**Peperomia turialvensis** var. **brachystachya** Trelease, Contr. U. S. Nat. Herb. 26: 219. 1929. Finca Las Cóncavas, Prov. Cartago, 1,200 meters, *Standley 41544*.

**Peperomia Valerioi** Trelease, Journ. Wash. Acad. Sci. 15: 458. 1925. El Arenal, Guanacaste, *Juvenal Valerio 31*. Endemic. This species, through oversight, is not listed in Trelease's monograph.

**Peperomia venabulifolia** Trelease, Contr. U. S. Nat. Herb. 26: 209. 1929. La Hondura, Prov. San José, 1,300–1,700 meters, *Standley 37774*. Endemic.

**Peperomia venabulifolia**(?) var. **amplectens** Trelease, var. nov.—Caulis vix 10 cm. altus 5 mm. crassus, internodiis brevibus; folia oblanceolata acute acuminata basin amplectantem versus cuneata 12–13 cm. longa 3 cm. lata; paniculae axillares, spicae usque 6 pedunculum gracilem circiter 8 cm. longum terminantes, 125 mm. longae 1 mm. crassae, pedicellis 10–15 mm. longis.—Los Angeles de San Ramón, 1,050 meters, epiphytic, *Brenes 4508* (type in Herb. Field Mus.).

**Peperomia versicolor** Trelease, Contr. U. S. Nat. Herb. 26: 200. 1929. Pejivalle, Prov. Cartago, 900 meters, *Standley & Valerio 47270*. Endemic.

**Peperomia vinasiana** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 231. 1891. Juan Viñas, Prov. Cartago, *Pittier 2199*. Endemic.

**Peperomia vinasiana** var. **macrocarpa** (C. DC.) Trelease, Contr. U. S. Nat. Herb. 26: 195. 1929. *P. macrocarpa* C. DC. Candollea 1: 339. 1923. Las Vueltas, Prov. Cartago, *Tonduz 13134*.

**Peperomia virillana** Trelease, Contr. U. S. Nat. Herb. 26: 198. 1929. San Juan, Río Virilla, *Tonduz 945b*. Endemic.

**Peperomia vueltasana** Trelease, Contr. U. S. Nat. Herb. 26: 198. 1929. Las Vueltas, Tucurrique, Prov. Cartago, 700 meters, *Tonduz 13130*. Collected also at Orosi. Endemic.

**Peperomia zurquiana** Trelease, Contr. U. S. Nat. Herb. 26: 202. 1929. Cerros de Zurquí, Prov. Heredia, 2,000–2,400 meters, *Standley & Valerio 50758*. Slopes of Volcán de Barba. Endemic.

## PIPER L.

Shrubs or sometimes small trees, very rarely herbaceous plants, seldom if ever epiphytic, the leaves large or small, not fleshy.—For Costa Rica there are listed about 290 species, many of which are of very restricted distribution. Most of these I believe, are valid species, with definitely marked characters, but there are certain groups in which the plants are exceedingly variable, and

in these it seems that too many species have been described. All the species listed here are endemic, except a few for which wider distribution is indicated. One of the oriental species of *Piper* furnishes pepper of commerce. Although abundant in Costa Rica, as well as in most parts of Central America, the plants are of little or no economic importance. They are plentiful almost everywhere in Costa Rica except at the highest elevations and form an important part of the forest undergrowth, but they are never conspicuous, particularly because their flowers are minute and green.

**Piper acuminatissimum** C. DC. Bot. Gaz. 70: 189. 1920. San Carlos, *Pittier 16321*. Collected also in the same region by Koschny.

**Piper adenophlebium** Trelease, Contr. U. S. Nat. Herb. 26: 132. 1929. El Muñeco, Prov. Cartago, 1,400 meters, *Standley & Torres 51104*.

**Piper aduncifolium** Trelease, Contr. U. S. Nat. Herb. 26: 171. 1929. Carrillo, 300 meters, *Pittier 1196*. Endemic on the Atlantic plains. The species has been reported from Costa Rica under the names *P. hirsutum* var. *subsessilifolium* and *P. hispidum* var. *Olfersianum*.

**Piper aereum** Trelease, Contr. U. S. Nat. Herb. 26: 144. 1929. Near Orosi, Prov. Cartago, *Standley 29842*. Also at El Muñeco in the same region; region of San Ramón, 1,000 meters.

**Piper aguacalientis** Trelease, sp. nov.—Arbuscula nodosa, internodiis brevibus modice gracilibus scabro-hispidis aliquanto granulosis; folia oblique lanceolata acuminata, basi cordulata, 12–14 cm. longa 4.5–6 cm. lata, infra medium pinnatinervia, nervis circiter 5×2, valde rugosa, supra grosse granuloso-scabra sed non pilosa, subtus ad nervos breviter hirsuta, petiolo circiter 7 mm. longo hispido; spicae 80 mm. longae 4 mm. crassae rubrae, pedunculo vix 10 mm. longo scabrido; bracteae crescentico-subpeltatae.—Southwest of Agua Caliente, 1,560 meters, *H. E. Stork 1317* (type in herb. Univ. Illinois). Strongly suggestive of *P. rugosifolium*, but lacking the long hairs of the upper leaf surface.

**Piper alajuelanum** Trelease, Contr. U. S. Nat. Herb. 26: 158. 1929. Nuestro Amo, Alajuela, 800 meters, *Otón Jiménez 988*.

**Piper albuginiferum** Trelease, Contr. U. S. Nat. Herb. 26: 181. 1929. El Muñeco, Prov. Cartago, 1,500 meters, *Standley & Torres 51102*.

**Piper allisum** Trelease, sp. nov.—Frutex(?) *P. chrysostachyo* valde similis, internodiis subgracilibus elongatis essentialiter glabris; folia elliptica subbreviter acuminata, basi paullo inaequilaterali obtusa, 14–16 cm. longa 7–8 cm. lata, e medio inferiore submultiplinervia, nervis 6×2, subtus obscure crispo-puberula, petiolo 25–30 mm. longo glabrescente; stipulae conspicuae, primo tota longitudine petiolo adnatae; inflorescentia in sicco viso juvenilis.—La Palma de San Ramón, *Brenes 5937* (type in Herb. Field Mus.).

**Piper altevaginans** Trelease, Contr. U. S. Nat. Herb. 26: 140. 1929. Near Guápiles, Prov. Limón, 300–500 meters, *Standley 37316*.

**Piper anguillaespicum** Trelease, Contr. U. S. Nat. Herb. 26: 175. 1929. Near San Ramón, 900 meters, *Brenes 14197*.

**Piper anisophyllum** Trelease, Contr. U. S. Nat. Herb. 26: 157. 1929. El General, *Tonduz 3385*. Also in Boruca and Guanacaste.

**Piper anisophyllum** var. **granulatum** Trelease, var. nov.—Ramuli sicut petioli solemniter pallido-granulosi; petioli circiter 5+2 mm. longi; spicae 45 mm. longae 2 mm. crassae subacutae, pedunculo 5 mm. longo.—El General, Prov. San José, 1,000 meters, *A. F. Skutch 2740* (type in U. S. Nat. Herb.).

**Piper annulatum** Trelease, Contr. U. S. Nat. Herb. 26: 139. 1929. *Cordoncillo*. Cerro de La Carpintera, Prov. Cartago, 1,500–1,800 meters, *Standley 35500*. A shrub of 2.5 meters. The name Cordoncillo is given commonly to almost all Central American species of *Piper*.

**Piper aragonense** Trelease, Contr. U. S. Nat. Herb. 26: 146. 1929. Aragón, near Turrialba, 700 meters, *Tonduz 9021*. Also at various places on the Atlantic coast. Reported for Costa Rica under the name *P. multiplinervium*.

**Piper arcessitum** Trelease, Contr. U. S. Nat. Herb. 26: 143. 1929. El Muñeco, Prov. Cartago, 1,500 meters, *Standley & Torres 51357*. Also at Juan Viñas.

**Piper arcte-acuminatum** Trelease, Contr. U. S. Nat. Herb. 26: 136. 1929. Near Guápiles, 300–500 meters, *Standley 37115*.

**Piper arieianum** C. DC. Anal. Inst. Costa Rica 9: 166. 1897. Valle de La Estrella, Talamanca, *Tonduz 9387*.

**Piper artanthopse** C. DC. Journ. Bot. 4: 161. 1866. *P. Oerstedii* C. DC. Linnaea 37: 359. 1872 (type from Costa Rica). Monte Aguacate, *Hoffmann 687*. Also San Ramón, *Brenes*.

**Piper articulosum** Trelease, sp. nov.—Frutex(?), ramis geniculato-flexuosis subtomentulosis, internodiis brevibus; folia lanceolata longiacuminata, basi subaequilaterali acuta, 11–14 cm. longa 3.5–5 cm. lata, e medio inferiore pinnatinervia, nervis 5×2 supra impressis, subtus salientibus, lamina supra granuloso-scabrida subtus ad nervos hispida, petiolo 5–10 mm. longo transiente subhispido; spicae 60 mm. longae 3 mm. crassae apiculatae, pedunculo 10 mm. longo; bracteae rotundo-subpeltatae ciliolatae.—San Ramón to La Paz, *Brenes 6060* (type in Herb. Field Mus.).

**Piper arundinetorum** Trelease, Contr. U. S. Nat. Herb. 26: 159. 1929. Forest near Laguna de La Escuadra, near El Copey, 2,100 meters, *Standley 41967*.

**Piper aserrianum** Trelease, Contr. U. S. Nat Herb. 26: 151. 1929. Between Aserrí and Tarbaca, Prov. San José, 1,600–1,900 meters, *Standley 34151*. Also Fraijanes and Cerro de La Carpintera.

**Piper asymmetricum** C. DC. Anal. Inst. Costa Rica 9: 172. 1897. Río Naranjo, *Tonduz 7661*. Also in Nicaragua.

**Piper auriculiferum** Trelease, Contr. U. S. Nat. Herb. 26: 156. 1929. El Silencio, near Tilarán, Guanacaste, 750 meters, *Standley & Valerio 44648*.

**Piper auritifolium** Trelease, Contr. U. S. Nat. Herb. 26: 154. 1929. Finca Hamburgo, near El Cairo, Prov. Limón, *Standley & Valerio 48773*. A plant very much like *P. auritum*.

**Piper auritum** HBK. *Hoja de la estrella, Estrella, Hinojillo, Anisillo, Monca blanca*. *P. auritum* var. *amplifolium* C. DC. in DC. Prodr. 16, pt. 1: 321. 1869 (without locality, *Hoffmann 761*). Abundant in moist places of the tierra caliente, ascending to the Meseta Central. Common through much of Central America and Mexico. Plants herbaceous, or shrubby and 1–3 meters high, with very large leaves. All parts have a strong and agreeable odor similar to that of sarsaparilla. In Costa Rica the fresh leaves are said to be applied to relieve headache and probably for the cure of other ailments, especially to relieve the pain of wounds. Pittier reports for this species the Cabécara name of Pir-ku.

**Piper baculiferum** Trelease, Contr. U. S. Nat. Herb. 26: 180. 1929. *Cordoncillo*. El Arenal, Guanacaste, 500 meters, *Standley & Valerio 45052*. Known only from the mountains of Guanacaste. A shrub of 2 meters.

**Piper barbulatum** C. DC. Candollea 1: 124, 346. 1923. Nicoya, *Tonduz 13697*. Reported from Costa Rica as *P. Hostmannianum*.

**Piper biasperatum** Trelease, Contr. U. S. Nat. Herb. 26: 173. 1929. Cerro de La Carpintera, Prov. Cartago, 1,500–1,800 meters, *Standley 35723*. A common species of the mountains of the central region.

**Piper biauritum** C. DC. Anal. Inst. Costa Rica 9: 161. 1897. Shirores, Talamanca, *Tonduz 9270*.

**Piper biseriatum** C. DC. Bot. Gaz. 70: 178. 1920. Cañas Gordas, *Pittier 11036*.

**Piper blepharilepidum** Trelease, Contr. U. S. Nat. Herb. 26: 160. 1929. Quebrada Serena, near Tilarán, Guanacaste, 700 meters, *Standley & Valerio 46217*.

**Piper bocasense** Trelease, sp. nov.—Frutex(?), internodiis floriferis brevibus gracilibus pallido-subvillosis; folia lanceolata acuminata, basi cordulata, 11–12 cm. longa 4–5 cm. lata, e medio inferiore pinnatinervia, nervis 5+6, rugosa, supra minute granuloso-scabra, subtus ad nervos molliter pilosa, petiolo vix 5 mm. longo molliter piloso; spicae 70 mm. longae 2–3 mm. crassae, pedunculo vix 5 mm. longo molliter piloso; bracteae minutae rotundo-subpeltatae pallido-ciliolatae.—Changuinola Valley, Province of Bocas del Toro, Panama, near the Costa Rican border, *V. C. Dunlap 234* (type in Herb. Field Mus.).

**Piper borucanum** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 219. 1891. Boruca, *Tonduz 3609*. Found also at San Ramón, Buenos Aires, and Golfo Dulce.

**Piper brachistopodum** C. DC. Bot. Gaz. 70: 182. 1920. Las Vueltas, Tucurrique, *Tonduz 13143*.

**Piper Brenesii** C. DC. Bot. Gaz. 70: 180. 1920. San Ramón, *Brenes 14190*.

**Piper brevistylum** C. DC. Anal. Inst. Costa Rica 9: 158. 1897. Puerto Viejo, Río Sarapiquí, *Biolley 7436*.

**Piper bryogetum** C. DC. Bot. Gaz. 70: 175. 1920. *P. bryogeton* C. DC. Candollea 1: 85. 1923. Las Vueltas, Tucurrique, *Pittier 12939*. Also Zent and Río Hondo, plains of Santa Clara.

**Piper bullulaefolium** Trelease, Contr. U. S. Nat. Herb. 26: 152. 1929. Los Ayotes, near Tilarán, Guanacaste, 650 meters, *Standley & Valerio 45363*. Known only from the region of Tilarán.

**Piper cabagranum** C. DC. Anal. Inst. Costa Rica 9: 173. 1897. Cabagra, near Buenos Aires, *Pittier 6528*.

**Piper caeruleifolium** Trelease, Contr. U. S. Nat. Herb. 26: 145. 1929. Quebrada Serena, near Tilarán, Guanacaste, 700 meters, *Standley & Valerio 46134*.

**Piper calcaratum** C. DC. Bot. Gaz. 70: 188. 1920. Las Vueltas, Tucurrique, *Tonduz 13185*.

**Piper calvirameum** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 200. 1891. Camino de Carrillo, *Biolley 3182*. Forests of the Atlantic coast.

**Piper candelarium** C. DC. Linnaea 37: 357. 1872 (Cerro de Candelaria, *Oersted 828*). *P. globosum* C. DC. Linnaea 37: 357. 1872 (Candelaria, *Oersted*). *P. psilocladum* C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 211. 1891 (Carrillo, *Biolley 3189*). Common on the coasts, ascending to the mountains of the central region. Listed for Costa Rica under the names *P. phthinotrichon* and *P. lanceolatum*.

**Piper candelarium** var. **angustatum** Trelease, Contr. U. S. Nat. Herb. 26: 137. 1929 (Río Diquís, *Pittier 10570*). *P. sepium* var. *glabrum* C. DC. Bot. Gaz. 70: 179. 1920. Also at La Palma de San José.

**Piper candelarium** var. **latifolium** C. DC. Anal. Inst. Costa Rica 9: 167. 1897. Puerto Viejo, Río Sarapiquí, *Biolley 7439*. Atlantic coast.

**Piper candelarium** var. **pedroanum** Trelease, var. nov.—Glaber, foliis subtus solemniter nigro-granulosis, superioribus lanceolatis, 12 cm. longis, 4.5 cm. latis, inferioribus ovatis, 18 cm. longis, 9.5 cm. latis; spicae 10–12 mm. longae 4 mm. crassae apiculatae refractae, pedunculo filiformi aequilongo.—Colinas de San Pedro de San Ramón, *Brenes 19119* (type in Herb. Field Mus.).

**Piper candelarium** var. **sepium** (C. DC.) Trelease, Contr. U. S. Nat. Herb. 26: 137. 1929. *P. sepium* C. DC. Anal. Inst. Costa Rica 9: 168. 1897. Turrialba, *Tonduz 8345*. Also at El Coyolar, Prov. Alajuela.

**Piper capacibracteum** Trelease, Contr. U. S. Nat. Herb. 26: 183. 1929. *Cordoncillo*. Between Aserrí and Tarbaca, Prov. San José, *Standley 41397*. Also Santa María de Dota and Peralta. A shrub of 1.5–2.5 meters.

**Piper captum** Trelease, sp. nov.—Frutex 3-metralis, nervis folii subtus minute puberulis exceptis glaber, internodiis floriferis breviusculis crassiusculis; folia elliptico-suboblanceolata acuminata, basin acutam versus inaequaliter attenuata, 18–20 cm. longa 7–9 cm. lata, e 2 tertiis inferioribus pinnatinervia, nervis 5×2, obscure viridia et sublucida, petiolo vix 10 mm. longo; spicae 100 mm. longae 4 mm. crassae, pedunculo 10 mm. longo; bracteae rotundo-subpeltatae ciliolatae.—El General, Prov. San José, 915 meters, *A. F. Skutch 2158* (type in U. S. Nat. Herb.).

**Piper carminis** Trelease, Contr. U. S. Nat. Herb. 26: 179. 1929. El Carmen, Prov. Limón, *Standley & Valerio 48383*.

**Piper carnosicaule** Trelease, Contr. U. S. Nat. Herb. 26: 168. 1929. El Muñeco, Río Navarro, Prov. Cartago, 1,500 meters, *Standley & Valerio 51050*.

**Piper carpinteranum** C. DC. Anal. Inst. Costa Rica 9: 165. 1897. *Cordoncillo.* Cerro de La Carpintera, *Pittier & Tonduz 4348*. Region of Cartago. A shrub 2 meters high.

**Piper carilloanum** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 209. 1891. Camino de Carrillo, *Tonduz 2525*.

**Piper cartagoanum** C. DC. Linnaea 37: 350. 1872. Cartago, *Oersted 829*.

**Piper catacryptum** Trelease, Contr. U. S. Nat. Herb. 26: 166. 1929. Rodeo de Pacaca, *Pittier 3293*. A common shrub of the mountains of Guanacaste.

**Piper catalinianum** Trelease, sp. nov.—Frutex(?) subgracilis, internodiis floriferis brevibus gracilibus striatis pallido-punctatis prope nodos plus minusve breviter pubescentibus; folia elliptica falcate acuto-acuminata, basi obtusa latere altero paullo breviore (foliis inferioribus interdum ovatis et basi aequaliter rotundatis), 16–18 cm. longa 6–7 cm. lata, infra medium pinnatinervia, nervis circiter 5×2, in sicco tenuia, subtus ad nervos sparse substrigosa, petiolo 10–15 mm. longo aliquanto hirtello; spicae 50 mm. longae 2 mm. crassae, pedunculo 10 mm. longo glabrescente; bracteae rotundo-subpeltatae ciliatae; stigmata 3 sessilia.—Catalina, Guanacaste, 10 meters, *H. E. Stork 2779* (type in herb. Univ. Illinois).

**Piper caudatifolium** Trelease, Contr. U. S. Nat. Herb. 26: 177. 1929. Las Pavas, Prov. San José, 800 meters, *Pittier 3191*.

**Piper ceibense** C. DC. Anal. Inst. Costa Rica 9: 163. 1897. Buenos Aires, Río Ceibo, *Pittier 4902*. Also headwaters of Río Diquís and Golfo Dulce.

**Piper celatipetiolum** Trelease, Contr. U. S. Nat. Herb. 26: 156. 1929. Capulín, Prov. Alajuela, 80 meters, *Standley 40178*.

**Piper celtidifolium** HBK. *Cordoncillo*. A common shrub of the tierra caliente, ascending to the Meseta Central. Ranging from Nicaragua to the Guianas. Listed for Costa Rica under the names *P. aduncum*, *P. angustifolium*, *P. confusum*, and *P. elongatum*. Perhaps only a form of *P. aduncum* L., considered by some authors to be a very variable species of wide distribution. Lehmann cites for the plant the Guatuso name of Pokori.

**Piper cenocladum** C. DC. Anal. Inst. Costa Rica 9: 168. 1897. Tsaki, Talamanca, *Tonduz 9533*. Also Las Vueltas de Tucurrique and Finca Montecristo, Río Reventazón.

**Piper cercidiphyllum** Trelease, Contr. U. S. Nat. Herb. 26: 146. 1929. *Cordoncillo*. Quebrada Grande, near Tilarán, 650 meters, *Standley & Valerio 46110*. Also Golfo Dulce. A shrub of 2.5 meters.

**Piper changuinolanum** Trelease, sp. nov.—Frutex nodosus ubique scaber, internodiis brevibus subgracilibus in sicco sulcatis dense minute griseo-hispidis; folia inaequilateraliter vel subfalcate oblonga acuminata, basi rotundata atque altero latere breviora, subparva 15 cm. longa 4 cm. lata, infra medium pinnatinervia, nervis circiter 5×2, infimis subapproximatis, paullo rugosa, opaca, subtus pallidiora granuloso-punctulata ad nervos adpresso-pubescentia, petiolo brevi vix 5+5 mm. longo basi alato primo adpresso-piloso; spicae 80–100 mm. longae 2–3 mm. crassae, pedunculo breviusculo 10 mm. longo adpresso-hispido; bracteae parvae rotundo-subpeltatae ciliatae; baccae breviter oblongae plerumque cum rhachide elongatae glabrae; stigmata 3 minuta sessilia.—Changuinola Valley, Province of Bocas del Toro, Panama, near the Costa Rican border, *V. C. Dunlap 233* (type in U. S. Nat. Herb.).

**Piper chirripoense** C. DC. Bot. Gaz. 70: 186. 1920. Chirripó, 100 meters, *Pittier 16061*.

**Piper chrysostachyum** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 207. 1891. Río Surubres, San Mateo, *Biolley 4073*. Also Buenos Aires and San Juan de San Ramón.

**Piper ciliatifolium** Trelease, Contr. U. S. Nat. Herb. 26: 152. 1929. *Cordoncillo.* Finca La Colombiana, Prov. Limón, 70 meters, *Standley 36770.* A shrub of 2–3.5 meters.

**Piper cincinnatum** Trelease, Contr. U. S. Nat. Herb. 26: 151. 1929. Finca La Colombiana, Prov. Limón, 70 meters, *Standley 36778.*

**Piper clavuliger** Trelease, Contr. U. S. Nat. Herb. 26: 151. 1929. Pejivalle, Prov. Cartago, 900 meters, *Standley & Valerio 47088.* Also El Muñeco and La Hondura de San José.

**Piper clavulispicum** Trelease, sp. nov.—Ut videtur frutex, nodosus, internodiis floriferis modice gracilibus brevibus pilis intertextis molliter pilosis; folia congesta elliptica acuminata, basi obtusa altero latere cordulata, 10–13 cm. longa 4.5–6 cm. lata, e medio inferiore pinnatinervia, nervis circiter 5×2, paullo rugescentia, supra minute molliter pubescentia, subtus pilis longis subtomentosa, petiolo vix 5 mm. longo subtomentoso; spicae 20 mm. longae 2 mm. crassae apiculatae rectae vel uncatae, pedunculo vix 5 mm. longo subtomentoso.—El Rodeo, *C. H. Lankester 1318* (type in Herb. Field Mus.).

**Piper coactoris** Trelease, Contr. U. S. Nat. Herb. 26: 161. 1929. Viento Fresco, Prov. Alajuela, 1,600–1,900 meters, *Standley & Torres 47935.* Region of Fraijanes and San Isidro de Heredia.

**Piper coarctatum** Trelease, Contr. U. S. Nat. Herb. 26: 168. 1929. El Muñeco, Río Navarro, Prov. Cartago, 1,400 meters, *Standley 33578.*

**Piper coilostachyum** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 212. 1891. El General, *Tonduz 3382.*

**Piper colemanense** Trelease, sp. nov.—Frutex(?) glaber, internodiis floriferis brevibus gracilibus; folia ovato-lanceolata sensim longiacuminata, basi paullo inaequilaterali acuta, 9–12 cm. longa 3–4.5 cm. lata infra medium submultiplinervia, nervis circiter 5×2, in sicco caeruleo-viridia chartacea, petiolo 15–20 mm. longo concavo; spicae 30–50 mm. longae 4 mm. crassae obtusae, pedunculo circiter 10 mm. longo; bracteae subcucullatae; baccae subangulate rotundatae, stigmatibus sessilibus.—Potreros near Coleman Finca, above Santo Domingo del Roble, Prov. Heredia, 1,600 meters, *Dodge & Goerger 9580* (type in herb. Mo. Bot. Gard.).

**Piper comatum** Trelease, Contr. U. S. Nat. Herb. 26: 175. 1929. *P. hirsutum* var. *longepilosum* C. DC. Anal. Inst. Costa

Rica 9: 160. 1897. Río Corozal, Santo Domingo de Golfo Dulce, *Tonduz 9932*. Also at Matina.

**Piper compactum** Trelease, Contr. U. S. Nat. Herb. 26: 131. 1929. *Cordoncillo*. Near Santa María de Dota, 1,500–1,800 meters, *Standley 41801*. A dense shrub, 1.5–4.5 meters high, growing in hedges.

**Piper concepcionis** Trelease, Contr. U. S. Nat. Herb. 26: 159. 1929. La Concepción, Llanuras de Santa Clara, *J. D. Smith 6749*. Also at Guápiles.

**Piper conceptum** Trelease, sp. nov.—Frutex vix ultra 3 m. altus, internodiis floriferis breviusculis subgracilibus crispo-villosis; folia elliptica vel lanceolato-elliptica acute subacuminata, basi subinaequilateraliter acuta vel subobtusa, 12–17 cm. longa 6–7 cm. lata, fere ubique pinnatinervia, supra crispo-villosa, subtus minus dense induta, petiolo 15 mm. longo villoso; spicae 20–30 mm. longae 10 mm. crassae, pedunculo 10 mm. longo piloso; baccae globosae in stylum attenuatae.—El General, Prov. San José, 1,010 meters, *A. F. Skutch 2290* (type in U. S. Nat. Herb.).

**Piper concinnifolium** Trelease, Contr. U. S. Nat. Herb. 26: 167. 1929. Colinas de Piedades, San Ramón, 1,100 meters, *Brenes 14194*. Also in Guanacaste. Reported from Costa Rica under the names *P. mombachanum* and *P. concinnum*.

**Piper conscendens** Trelease, sp. nov.—Frutex scandens, internodiis longis gracilibus fuscescentibus glabratis; folia lanceolata vel subelliptico-lanceolata graciliter acuminata basi angustata aliquanto inaequilaterali-subcordulata, 11–12 cm. longa 3.5–5 cm. lata, supra minutissime scabrida, e medio inferiore pinnatinervia, nervis circiter 4×2, in sicco tenuia fusca, petiolo vix 5 mm. longo; spicae 90 mm. longae 2 mm. crassae, pedunculo 10 mm. longo; bracteae minutae rotundo-subpeltatae ciliolatae.—Changuinola Valley, Province of Bocas del Toro, Panama, near the Costa Rican border, *V. C. Dunlap 338* (type in Herb. Field Mus.).

**Piper Cookii** Trelease, Contr. U. S. Nat. Herb. 26: 174. 1929. Turrialba, *O. F. Cook & C. B. Doyle 376*.

**Piper copeyanum** (C. DC.) Trelease, Contr. U. S. Nat. Herb. 26: 149. 1929. *C. pulchrum* var. *copeyanum* C. DC. Bot. Gaz. 70: 189. 1920. *P. pulchrum* var. *costaricense* C. DC. Bull. Soc. Bot. Belg. 29, pt. 2: 70. 1890. Santa Rosa de Copey, *Tonduz 12198*.

Mountains of the central region, common in many places. A shrub of 2.5–3.5 meters.

**Piper coronatibracteum** Trelease, Contr. U. S. Nat. Herb. 26: 179. 1929. Finca Hamburgo, Prov. Limón, 55 meters, *Standley & Valerio 48844.*

**Piper corozalanum** Trelease, Contr. U. S. Nat. Herb. 26: 134. 1929. *Cordoncillo.* Río Corozal, Santo Domingo de Golfo Dulce, *Tonduz 10001.* Pacific coast, extending to the mountains of Guanacaste.

**Piper corrugatum** Kuntze, Rev. Gen. 2: 565. 1891. *P. tsakianum* C. DC. Anal. Inst. Costa Rica 9: 174. 1897 (Tsaki, *Tonduz 9532*). Limón, *Kuntze 2022.* Collected by Brenes at Los Angeles de San Ramón.

**Piper costaricense** C. DC. in DC. Prodr. 16, pt. 1: 328. 1869. El Aguacate, *Hoffmann 678.* Volcán de Poás, Río Ciruelas; Las Cóncavas; region of San Ramón, 1,000 meters.

**Piper crispans** Trelease, sp. nov.—Frutex gracilis glaber nodosus multiramosus vix 2-metralis, internodiis superioribus gracilibus brevibus; folia lanceolata graciliter acuminata apice ipso truncato, basi acuta, 9–12 cm. longa 2.5–3.5 cm. lata, e 2 tertiis inferioribus pinnatinervia, nervis circiter 4×2, in sicco papyracea, petiolo gracili 5 mm. longo; spicae circiter 50 mm. longae 2 mm. crassae, pedunculo gracili 10 mm. longo.—La Palma de San Ramón, 1,050 meters, *Brenes 5236* (type in Herb. Field Mus.).

**Piper crispatimargine** Trelease, sp. nov.—Frutex vix 2-metralis, internodiis superioribus gracilibus cito elongatis glabris; folia plus minusve subrhombeo-elliptica graciliter acuminata, basi angustata aliquanto cordulata vel altero latere rotundata atque paullo breviora, 9–11 cm. longa 4–4.5 cm. lata, e medio inferiore pinnatinervia, nervis 5×2, subcrispata, subtus ad nervos adpresso-pubescentia, petiolo gracili 10–15 mm. longo glabrato; spicae 3 mm. crassae, pedunculo filiformi 5 mm. longo apice refracto.—Palmira del Naranjo, 1,850–1,900 meters, *Brenes 3499* (type in Herb. Field Mus.).

**Piper curridabatanum** Trelease, Contr. U. S. Nat. Herb. 26: 183. 1929. Between San Pedro and Curridabat, Prov. San José, 1,200 meters, *Standley 33787.*

**Piper curtispicum** C. DC. Anal. Inst. Costa Rica 9: 170. 1897. Río Naranjo, *Tonduz 7523.*

**Piper curvipilum** Trelease, Contr. U. S. Nat. Herb. 26: 172. 1929. *P. hirsutum* var. *pallescens* C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 204. 1891. Agua Caliente, *Tonduz 2530*. Llanuras de Santa Clara and valley of the Reventazón.

**Piper cuspidispicum** Trelease, Contr. U. S. Nat. Herb. 26: 138. 1929. *Cordoncillo*. Cerro de La Carpintera, 1,500–1,800 meters, *Standley 35642*. Also on the slopes of Barba. A shrub of 2.5 meters. Reported under the name *P. singulare*.

**Piper cyanophyllum** Trelease, Contr. U. S. Nat. Herb. 26: 136. 1929. Río Naranjo, *Tonduz 7576*.

**Piper cyphophyllum** C. DC. Anal. Inst. Costa Rica 9: 167. 1897. *P. gibbifolium* C. DC. Bot. Gaz. 70: 181. 1920 (Hacienda de Zent, *Tonduz 14649*). Without definite locality, *Pittier 895*. Atlantic coast.

**Piper dasypogon** C. DC. Bot. Gaz. 70: 187. 1920. Buenos Aires, *Pittier 10641*.

**Piper decurrens** C. DC. Journ. Bot. 4: 215. 1866. Cerro de Candelaria, *Hoffmann* 853. Also on the slopes of Poás and Barba, and region of Cartago.

**Piper deductum** Trelease, sp. nov.—Frutex humilis, ramis geniculatis, internodiis brevibus subgracilibus primo sparse adpresso-villosis; folia lanceolata sensim acuta, basi acuta, 10–15 cm. longa 3–5 cm. lata ubique pinnatinervia, nervis tenuibus circiter 8×2, in sicco papyracea, utrinque sparse adpresso- vel crispo-villosa, petiolo 5 mm. longo laxe subvilloso; spicae deflexae, eis visis parvis et breviter pedunculatis.—El General, Prov. San José, 975 meters, *A. F. Skutch 2971* (type in U. S. Nat. Herb.).

**Piper delectans** Trelease, sp. nov.—Frutex glaber 2-metralis, internodiis floriferis brevibus subgracilibus; folia elliptica vel late sublanceolata acute acuminata, basi rotundata vel subacuta altero latere breviore, 27–32 cm. longa 13–15 cm. lata, fere ubique pinnatinervia, nervis gracilibus circiter 10×2, in sicco tenuia, petiolo circiter 10+5 mm. longo; spicae 50 mm. longae 4 mm. crassae, pedunculo 10 mm. longo; bracteae rotundo-subpeltatae, centro parvo fusco.—El General, Prov. San José, 1,220 meters, *A. F. Skutch 2479* (type in U. S. Nat. Herb.).

**Piper detonsum** Trelease, Contr. U. S. Nat. Herb. 26: 141. 1929. *Cordoncillo*. Near Tilarán, Guanacaste, *Standley & Valerio 44314*. Mountains of Guanacaste.

**Piper diquisanum** C. DC. Bot. Gaz. 70: 185. 1920. Headwaters of Río Diquís, *Pittier 10567*.

**Piper disparifolium** Trelease, Contr. U. S. Nat. Herb. 26: 156. 1929. Pejivalle, Prov. Cartago, 900 meters, *Standley & Valerio 46993*. Also El Muñeco and Peralta.

**Piper disparipes** Trelease, Contr. U. S. Nat. Herb. 26: 162. 1929. El Silencio, Atlantic slope, near Tilarán, Guanacaste, 750 meters, *Standley & Valerio 44766*. Also on the Pacific slope of the mountains near Tilarán.

**Piper disparispicum** Trelease, Contr. U. S. Nat. Herb. 26: 170. 1929. *Cordoncillo*. Escasú, Prov. San José, 1,250 meters, *Standley 32319*. A shrub 2.5 meters high.

**Piper dissimulans** Trelease, Contr. U. S. Nat. Herb. 26: 133. 1929. Forests of Las Vueltas, Tucurrique, 635 meters, *Tonduz 13773*. Turrialba to the Meseta Central. Reported under the names *P. papantlense* and *P. plantagineum*.

**Piper domingense** C. DC. Anal. Inst. Costa Rica 9: 161. 1897. Santo Domingo de Golfo Dulce, *Tonduz 10034*.

**Piper dotanum** Trelease, Contr. U. S. Nat. Herb. 26: 165. 1929. Santa María de Dota, 1,500–1,800 meters, *Standley 4139*.

**Piper dryadum** C. DC. Bull. Soc. Belg. 30, pt. 1: 321. 1891. Siquirres, *Pittier 3193*.

**Piper dumeticola** C. DC. Anal. Inst. Costa Rica 9: 164. 1897. Boruca, *Tonduz 4490*. Pacific coast to Guanacaste, and Cantón de Dota.

**Piper ducis** Trelease, sp. nov.—Frutex glaber 1.5 m. altus, internodiis floriferis breviusculis subgracilibus; folia subovato-lanceolata sensim longiacuminata, basi fere aequilaterali cordulata, 17–22 cm. longa 6–7 cm. lata, ubique pinnatinervia, nervis circiter 10×2 intermediis interpositis, petiolo circiter 15 mm. longo anguste caduce alato; spicae 60 mm. longae 5 mm. crassae apiculatae, pedunculo vix 10 mm. longo; bracteae crescenticae; baccae ellipsoideae cum rhachide elongatae; stigmata 3 parva sessilia.—El General, Prov. San José, 950 meters, *A. F. Skutch 2179* (type in U. S. Nat. Herb.).

**Piper dumetorum** C. DC. Anal. Inst. Costa Rica 9: 172. 1897. Turrialba, *Tonduz 8366*.

**Piper Dunlapi** Trelease, sp. nov.—Frutex glaber nodosus, internodiis floriferis subgracilibus breviusculis granulosis in sicco fuscis; folia ovata vel lanceolato-ovata plus minusve acute acuminata, basi subinaequaliter acuta usque aequilateraliter rotundata, modice parva, 13 cm. longa 5–5.5 cm. lata, submultiplinervia, costa utroque latere infra medium vel in 2 tertiis inferioribus ramulos ca. 5 emittente, ramis infimis basalibus, plus minusve glandulosogranulosa, petiolo brevi 10–15 mm. longo basi tantum vel in foliis majoribus tota longitudine alato; spicae ante anthesin subparvae 23 mm. longae 3 mm. crassae mucronatae, pedunculo gracili brevi vix 10 mm. longo; bracteae subrotundo-subpeltatae brunneo-umbonatae, margine lato flavescente ciliolato.—Changuinola Valley, Province of Bocas del Toro, Panama, near the Costa Rican border, *A. C. Dunlap 231* (type in Herb. Field Mus.).

**Piper echeverrianum** Trelease, Contr. U. S. Nat. Herb. 26: 172. 1929. Echeverría, *Pittier 2547*. Tierra caliente of the Pacific coast; Nicoya. Reported from Costa Rica as *P. hirsutum* var. *magnifolium*.

**Piper ejuncidum** Trelease, Contr. U. S. Nat. Herb. 26: 164. 1929. Cerro de Las Caricias, above San Isidro, Prov. Heredia, 2,300 meters, *Standley & Valerio 52320*. Slopes of Barba and at Santa María de Dota.

**Piper elliptico-lanceolatum** (C. DC.) Trelease, Contr. U. S. Nat. Herb. 26: 167. 1929. *P. aequale* var. *elliptico-lanceolatum* C. DC. Bot. Gaz. 70: 171. 1920. Colinas de Piedades, San Ramón, *Brenes 14185*. Also Cabagra, Cañas Gordas, and Colinas de Chirripó.

**Piper emollitum** Trelease, Contr. U. S. Nat. Herb. 26: 181. 1929. El Silencio, Atlantic slope, near Tilarán, Guanacaste, 750 meters, *Standley & Valerio 44650*. Also on the Pacific slope of the mountains of Tilarán.

**Piper epigynum** C. DC. Linnaea 37: 346. 1872. Turrialba, *Oersted 858*.

**Piper escasuense** Trelease, Contr. U. S. Nat. Herb. 26: 144. 1929. Cerro de Piedra Blanca, above Escasú, Prov. San José, *Standley 32627*.

**Piper escuadranum** Trelease, Contr. U. S. Nat. Herb. 26: 150. 1929. Laguna de La Escuadra, near El Copey, Prov. San José, 2,000 meters, *Standley 41965*.

**Piper Esquivelanum** Trelease, Contr. U. S. Nat. Herb. 26: 161. 1929. *Cordoncillo.* El Arenal, Guanacaste, 500 meters, *Standley & Valerio 45042.* The species is dedicated to Don Daniel Esquivel of Tilarán.

**Piper euryphyllum** C. DC. Bot. Gaz. 70: 178. 1920. *P. triseriale* C. DC. Bot. Gaz. 70: 187. 1920 (La Palma, *Pittier 12663*). La Palma, *Tonduz 12666.*

**Piper evasum** Trelease, Contr. U. S. Nat. Herb. 26: 155. 1929. El Arenal, Atlantic slope, Guanacaste, 500 meters, *Standley & Valerio 45280.*

**Piper exiguispicum** Trelease, Contr. U. S. Nat. Herb. 26: 153. 1929. Boca de Zhorquín, Talamanca, *Tonduz 8641.*

**Piper falcigerum** Trelease, Contr. U. S. Nat. Herb. 26: 147. 1929. El Silencio, Atlantic slope, Guanacaste, 750 meters, *Standley & Valerio 44747.*

**Piper figlinum** Trelease, Contr. U. S. Nat. Herb. 26: 142. 1929. *Cordoncillo.* Near Santa María de Dota, 1,500–1,800 meters, *Standley & Valerio 43112.*

**Piper fimbriulatum** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 207. 1891. El General, *Tonduz 3393.*

**Piper flavescens** (C. DC.) Trelease, Contr. U. S. Nat. Herb. 26: 184. 1929. *P. pseudovelutinum* var. *flavescens* C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 203. 1891. Río Tilirí, near San José, *Tonduz 3175.*

**Piper flavirameum** C. DC. Bot. Gaz. 70: 181. 1920. La Palma, *Pittier 12510.*

**Piper flavirameum** var. **obscurum** Trelease, var. nov.—A typo internodiis saepe valde elongatis in sicco fuscis differt; spicae juveniles 30 mm. longae 2 mm. crassae, pedunculo 10 mm. longo.—La Palma de San Ramón, *Brenes 20629* (type in Herb. Field Mus.); also *No. 15056.* Los Angeles de San Ramón, *Brenes 14856.*

**Piper formici-tolerans** Trelease, sp. nov.—Arbor gracilis 8-metralis, foliis supra glabris exceptis dense brunneo-tomentulosa; folia late elliptica abrupte breviter acuminata, basi aliquanto inaequaliter cordata, sinu clauso, 30–40 cm. longa 18–23 cm. lata, e 2 tertiis inferioribus pinnatinervia, nervis circiter 6+7, petiolo 5–6 cm. longo alato sinum vix aequante; spicae 400 mm. longae

5–6 mm. crassae, pedunculo 3 cm. longo; bracteae rotundo-subpeltatae tomentulosae.—El General, Prov. San José, 915 meters, *A. F. Skutch 2156* (type in U. S. Nat. Herb.). The hollow branches are inhabited by ants.

**Piper fusco-bracteatum** Trelease, Contr. U. S. Nat. Herb. 26: 183. 1929. Cerro de Piedra Blanca, Escasú, Prov. San José, *Standley 32631*. A shrub of 3 meters.

**Piper fusco-granulatum** Trelease, Contr. U. S. Nat. Herb. 26: 180. 1929. Hacienda de Zent, *United Fruit Co. 269*.

**Piper generalense** Trelease, sp. nov.—Fruticulus sylvicola 60 cm. tantum altus, nervis subtus velutinis exceptis essentialiter glaber, ramulis fuscescentibus, internodiis brevibus gracilibus puberulis; folia lanceolato-oblonga utrinque acuta, basi paullo obliqua, 12–14 cm. longa 3.5–4 cm. lata, fere ubique pinnatinervia, nervis longioribus 6×2 sed sursum arcuatis, petiolo gracili 5 mm. longo; spicae 25 mm. longae 3 mm. crassae, pedunculo vix 10 mm. longo recurvo; bracteae subcrescenticae; baccae transverse subellipticae truncatae, margine elevato, stigmatibus sessilibus.—El General, Prov. San José, 1,160 meters, *A. F. Skutch 2846* (type in U. S. Nat. Herb.).

**Piper genuflexum** Trelease, Contr. U. S. Nat. Herb. 26: 172. 1929. Santa Rosa del Copey, 1,800 meters, *Tonduz 11687*.

**Piper gibbosum** C. DC. Bull Soc. Bot. Belg. 30, pt. 1: 212. 1891. Rancho Flores, slopes of Volcán de Barba, *Tonduz 2088*.

**Piper glabrifolium** C. DC. Anal. Inst. Costa Rica 9: 163. 1897. Río Naranjo, *Tonduz 7553*.

**Piper Goergeri** Trelease, sp. nov.—Frutex(?), internodiis gracilibus sed breviusculis primo crispo-velutinis; folia anguste lanceolata sensim acuta, basi altero latere cordulata, 10–13 cm. longa 2–2.5 cm. lata, infra medium pinnatinervia, nervis circiter 5+6, subtus subadpresso-pubescentia, petiolo circiter 5 mm. longo alato subadpresso-pubescente; spicae curvae 50 mm. longae 2 mm. crassae, pedunculo vix 10 mm. longo subvelutino; bracteae subpeltatae; baccae triquetrae, stigmatibus sessilibus.—Finca Castilla, Río Reventazón, 30 meters, *C. W. Dodge & V. F. Goerger 9421* (type in herb. Mo. Bot. Gard.).

**Piper gonagricum** Trelease, Contr. U. S. Nat. Herb. 26: 172. 1929. Yerba Buena, above San Isidro de Heredia, 2,000 meters, *Standley & Valerio 49082*. El Tablazo and slopes of Barba.

**Piper gracilipedunculum** Trelease, Contr. U. S. Nat. Herb. 26: 148. 1929. Fraijanes, Prov. Alajuela, 1,500–1,700 meters, *Standley & Torres 47519*. Common in mountains of the central region.

**Piper granulatum** Trelease, Contr. U. S. Nat. Herb. 26: 175. 1929. Buenos Aires, 250 meters, *Pittier 3593*. Frequent on the Pacific slope.

**Piper griseo-pubens** Trelease, Contr. U. S. Nat. Herb. 26: 176. 1929. Líbano, Guanacaste, 300 meters, *Standley & Valerio 44879*.

**Piper griseo-pubens** var. **revocabile** Trelease, loc. cit. Tilarán, Guanacaste, 600 meters, *Standley & Valerio 44943*.

**Piper guacimonum** (C. DC.) Trelease, Contr. U. S. Nat. Herb. 26: 169. 1929. *P. sepium* var. *guacimonum* C. DC. Bot. Gaz. 70: 179, 1920. Guácimo, *Tonduz 14656*.

**Piper guanacastense** C. DC. Linnaea 37: 356. 1872. Guanacaste, *Oersted 862*. A common species of the tierra caliente of the Pacific slope. Reported by authors under the name *P. trinerve*.

**Piper Hanckeli** Trelease, sp. nov.—Frutex(?) glaber, internodiis superioribus brevibus, inferioribus elongatis, plus minusve granulosis; folia ovata sensim acuminata, basi inaequilaterali rotundata vel plerumque cordulata, 7–15 cm. longa 5–9 cm. lata, infra medium submultiplinervia, nervis subtus roseis cito glabrescentibus 5×2, in sicco firmo-papyracea opaca, subtus pallida, petiolo circiter 10 mm. longo; spicae juveniles 30 mm. longae 3 mm. crassae, pedunculo 5 mm. longo; bracteae rotundo-subpeltatae ciliatae.—Upper slopes of Cerro San José de Líbano, Guanacaste, 500–960 meters, *C. W. Dodge, R. Hanckel & W. S. Thomas 6384* in 1930 (type in Gray Herb.).

**Piper heptaneurum** Trelease, Contr. U. S. Nat. Herb. 26: 168. 1929. Turrialba, 200 meters, *Tonduz 4112*.

**Piper heterophlebium** Trelease, sp. nov.—Frutex glaber 4-metralis, internodiis floriferis brevibus gracilibus; folia multiformia vulgo basi obtusa, ovata usque lanceolata et palmatim 5-nervia, inferiora rotundo-ovata, basi cordata et prope basin 7–9-plinervia, acuminata, 8–10 cm. longa 3.5–6 cm. lata, petiolo 10–15 mm. longo; spicae 100 mm. longae 4 mm. crassae in statu fructifero arcuatae, pedunculo gracili 15 mm. longo; bracteae subcucullatae puberulae; baccae globosae, stigmatibus 3 latis sessilibus.—El General, Prov. San José, 880 meters, *A. F. Skutch 2293* (type in U. S. Nat. Herb.).

**Piper hians** Trelease, sp. nov.—Frutex 2-metralis rigido-villosus, foliis supra glabrescentibus; folia subobovato-oblonga acuminata, basi inaequilateraliter auriculata sinu laterali, 28–38 cm. longa 10–15 cm. lata, e 3 quartis inferioribus pinnatinervia, nervis circiter 5+8, petiolo circiter 7 cm. longo, latere altero 3 cm. breviore; spicae 175 mm. longae 6 mm. crassae, pedunculo 10 cm. longo; bracteae rotundo-subpeltatae pilosae.—El General, Prov. San José, 1,040 meters, *A. F. Skutch 2624* (type in U. S. Nat. Herb.).

**Piper humoense** Trelease, sp. nov.—Frutex(?) nodosus, internodiis floriferis breviusculis subgracilibus griseo-hispidis; folia lanceolato-elliptica acute acuminata, basi inaequilaterali cordulata, 11–16 cm. longa 4–6.5 cm. lata, infra medium pinnatinervia, nervis circiter 5×2, supra minute granuloso-asperata, nervis subtus hirsutis, petiolo vix 5+2 mm. longo latere longiore laminae occulto; spicae 100 mm. longae 2 mm. crassae, pedunculo 5 mm. longo hispido; bracteae rotundo-subpeltatae ciliolatae.—Pejivalle Farm, Río Humo, Prov. Cartago, 800 meters, *Dodge & Thomas 4371* (type in Gray Herb.).

**Piper imparipes** Trelease, Contr. U. S. Nat. Herb. 26: 163. 1929. La Verbena, near San José, 1,200 meters, *Standley 32244*.

**Piper impube** Trelease, Contr. U. S. Nat. Herb. 26: 142. 1929. Naranjos Agrios, Guanacaste, 600 meters, *Standley & Valerio 46494*. Known only from the region of Tilarán.

**Piper inhorrescens** Trelease, Contr. U. S. Nat. Herb. 26: 177. 1929. *Cordoncillo*. Las Pavas, Prov. San José, 1,870 meters, *Standley 36083*. Known only from the vicinity of San José.

**Piper injucundum** Trelease, Contr. U. S. Nat. Herb. 26: 181. 1929. El Muñeco, Río Navarro, Prov. Cartago, 1,500 meters, *Standley & Valerio 51351*.

**Piper injucundum** var. **praepubinervium** Trelease, loc. cit. El Muñeco, *Standley & Valerio 51067*. Regions of Cartago and Pejivalle.

**Piper injucundum** var. **praecalvinervium** Trelease, loc. cit. El Muñeco, *Standley & Torres 51101*.

**Piper insolens** Trelease, Contr. U. S. Nat. Herb. 26: 156. 1929. Santa María de Dota, 1,600 meters, *Standley & Valerio 43306*.

**Piper irazuanum** C. DC. Linnaea 37: 340. 1872. Volcán de Irazú, *Oersted 866*. Mountains of the central region; region of San Ramón. Reported under the name *P. pachystachyon*.

**Piper irazuanum** var. **suborbiculatum** Trelease, Contr. U. S. Nat. Herb. 26: 137. 1929. Finca La Cima, above Los Lotes, Prov. San José, *Standley 42681*. Mountains of the central region and Cantón de Dota.

**Piper irrasum** Trelease, Contr. U. S. Nat. Herb. 26: 151. 1929. El Muñeco, Río Navarro, Prov. Cartago, 1,400 meters, *Standley & Valerio 50961*.

**Piper jubatum** Trelease, Contr. U. S. Nat. Herb. 26: 140. 1929. *Cordoncillo.* Finca La Colombiana, Prov. Limón, 70 meters, *Standley 36812*. Region of Guápiles. A shrub of 2.5–3 meters.

**Piper labeculatum** Trelease, Contr. U. S. Nat. Herb. 26: 139. 1929. *Cordoncillo.* El Arenal, Atlantic slope, Guanacaste, 500 meters, *Standley & Valerio 45053*. Mountains of Guanacaste.

**Piper laevius** (C. DC.) Trelease, Contr. U. S. Nat. Herb. 26: 174. 1929. *P. hirsutum* var. *laevius* C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 204. 1891. Puntarenas, *Pittier 496*.

**Piper lanatibracteum** Trelease, Contr. U. S. Nat. Herb. 26: 182. 1929. *P. hirsutum* var. *carpinterae* C. DC. Anal. Inst. Costa Rica 9: 160. 1897 (Cerro de La Carpintera, *Pittier 4349*). El Muñeco, Río Navarro, Prov. Cartago, *Standley 33419*. Regions of Cartago and San José. A shrub 2 meters high.

**Piper lanceibracteum** Trelease, Contr. U. S. Nat. Herb. 26: 182. 1929. Río Reventado near Cartago, 1,500 meters, *Standley & Valerio 49457*.

**Piper leptocladum** C. DC. Anal. Inst. Costa Rica 9: 184. 1897. *P. dilatatum* var. *leptocladum* C. DC. Candollea 1: 96. 1923. Río Tuis, *Pittier 8160*.

**Piper leptoneuron** C. DC. Bot. Gaz. 70: 184. 1920. Santa Clara, Las Delicias, *Pittier 10675*. Plains of the Atlantic coast.

**Piper leucophlebium** Trelease, Contr. U. S. Nat. Herb. 26: 176. 1929. *Cordoncillo.* Tilarán, Guanacaste, 600 meters, *Standley & Valerio 44277*. Region of Tilarán. A shrub of 2 meters.

**Piper lincolnense** Trelease, sp. nov.—Frutex(?), internodiis floriferis modice gracilibus et brevibus, prope nodos obscure ferrugineo-papillosis; folia late elliptica vel ovato-elliptica breviter acuminata, basi paullo inaequilaterali cordulata, 19–20 cm. longa 9.5–10.5 cm. lata, e 2 tertiis inferioribus pinnatinervia, nervis circiter 6×2, opaca, tenuia, nervis subtus ferrugineo-hirsutis, petiolo 15–20 mm. longo

alato papilloso-puberulo; spicae 60 mm. longae 3 mm. crassae, pedunculo subgracili 2 cm. longo paullo puberulo; bracteae concavae; baccae depressae cum rhachide paullo elongatae, stigmatibus deciduis ut videtur stylum brevem terminantibus.—Lincoln Creek, Changuinola Valley, Province of Bocas del Toro, Panama, near the Costa Rican border, *V. C. Dunlap 484* (type in Herb. Field Mus.).

**Piper linearifolium** C. DC. Linnaea 37: 355. 1872. Hacienda Santa Rosa, Guanacaste, *Oersted 868*. A common shrub almost everywhere except at the highest elevations. Reported under the names *P. lineatum* and *P. persicariaefolium*.

**Piper longepetiolatum** (C. DC.) Trelease, Contr. U. S. Nat. Herb. 26: 134. 1929. *P. geniculatum* var. *longepetiolatum* C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 201. 1891. El General, *Tonduz 3384*.

**Piper longevillosum** Trelease, Contr. U. S. Nat. Herb. 26: 155. 1929. El Silencio, Atlantic slope, Guanacaste, *Standley & Valerio 44695*.

**Piper longistipulum** C. DC. Bot. Gaz. 70: 175. 1920. Río Naranjo, *Pittier 8001*.

**Piper luridispicum** Trelease, sp. nov.—Frutex, ut videtur nervis folii subtus puberulis exceptis glaber, internodiis floriferis subgracilibus breviusculis; folia elliptica vel subovata acute acuminata, basi fere aequilaterali acuta vel paullo latiora et latere altero rotundata, 14–18 cm. longa 7–9 cm. lata, e medio vel 2 tertiis inferioribus pinnatinervia, nervis utroque latere 4–6, in sicco tenuia, petiolo 5–10 mm. longo; spicae 100 mm. longae 2 mm. crassae, pedunculo gracili 10 mm. longo; bracteae parvae subpeltatae, antheris pallidis fere occultae.—El Rodeo, *C. H. Lankester 1322* (type in Herb. Field Mus.).

**Piper machadoanum** C. DC. Anal. Inst. Costa Rica 9: 166. 1929. Boca Machado, Río San Juan, Nicaragua, *Pittier 9638*. A common shrub of the plains of the Atlantic coast. Reported under the name *P. dichotomum*.

**Piper machucanum** Trelease, Contr. U. S. Nat. Herb. 26: 174. 1929. San Mateo, Río Machuca, *Biolley 4068*. Also at Punta Mala.

**Piper magnifolium** (C. DC.) Trelease, Contr. U. S. Nat. Herb. 26: 131. 1929. *P. pseudo-Lindenii* var. *magnifolium* C. DC. Linnaea 37: 336. 1872. Naranjo, *Oersted*. Tierra caliente of the Atlantic slope.

**Piper magnilimbum** C. DC. Bot. Gaz. 70: 177. 1920. Cañas Gordas, *Pittier 11032*. Reported under the name *P. obliquum*.

**Piper marginatibaccum** Trelease, sp. nov.—Fruticulus metralis minute crispo-pubescens, internodiis floriferis gracilibus brevibus; folia lanceolata acute attenuata, basi fere aequilaterali acuta, 10–13 cm. longa 3–4 cm. lata, e medio inferiori pinnatinervia, nervis circiter 6×2 sursum arcuatis, supra glabrescentia, petiolo 5 mm. longo; spicae 50 mm. longae 4 mm. crassae, pedunculo gracili 10 mm. longo; baccae triquetrae truncatae, margine vulgo elevato; stigmata 3 minuta sessilia.—El General, Prov. San José, 1,010 meters, *A. F. Skutch 2183* (type in U. S. Nat. Herb.).

**Piper maternale** Trelease, sp. nov.—Frutex(?), internodiis floriferis modice gracilibus et elongatis in sicco purpurascentibus saltem infra petiolos aliquanto striatis et striato-pilosis; folia oblique subovato-elliptica longiuscule attenuata, basi inaequaliter cordulata, 11–15 cm. longa 6–7 cm. lata, e 2 tertiis inferioribus submultiplinervia, nervis circiter 6+7, in sicco lucida firma coerulescenti-viridia, nervis subtus adpresso-puberulis, petiolo vix 2+3 mm. longo dorso hirtello-lineato, auricula inferiore occulto; spicae 25–30 mm. longae 3 mm. crassae pallidae, pedunculo 7 mm. longo purpureo glabro; bracteae rotundo-subpeltatae, margine lato ciliolato.—Flat Rock, Almirante, Province of Bocas del Toro, Panama, *G. P. Cooper 210* (type in Herb. Field Mus.). Probably extending to nearby Costa Rica. A decoction of the plant is reported to be used to relieve pain of childbirth.

**Piper matinanum** C. DC. Anal. Inst. Costa Rica 9: 170. 1897. Matina, *Pittier 9759*.

**Piper melanocladum** C. DC. Bot. Gaz. 70: 176. 1920. Río Ariei, *Pittier 9370*. Atlantic coast.

**Piper micranthera** C. DC. Linnaea 37: 354. 1872. La Barranca, *Oersted 877*.

**Piper mirabile** Trelease, Contr. U. S. Nat. Herb. 26: 154. 1929. Santa Clara de Cartago, 1,900 meters, *Maxon & Harvey 8246*. A tree of 6–7 meters. The species is well marked by the unusually large leaves, and especially by the long, thick spikes, as much as 37 cm. in length.

**Piper naranjoanum** C. DC. Linnaea 37: 363. 1872. *Sarcorhachis naranjoana* Trel. Contr. U. S. Nat. Herb. 26: 17. 1927.

Naranjo, *Oersted 878*. Plains of the Atlantic coast, ascending to El Muñeco; Guanacaste. Also in Panama.

**Piper nemori-marginis** Trelease, sp. nov.—Arbuscula 6-metralis, internodiis superioribus brevibus crassis intertexte brunneo-subvillosis; folia ovata subabrupte breviacuminata, basi inaequilateraliter cordata, sinu basali aperto, 30 cm. longa 19 cm. lata, subtus tomentulosa et ad nervos molliter subvillosa, e 2 tertiis inferioribus submultiplinervia, nervis circiter 9×2, petiolo 5–6 cm. longo, latere altero 5 mm. longiore, dense breviter brunneo-villoso alato; spicae fere 500 mm. longae 5 mm. crassae, pedunculo crasso 2 cm. longo glabrato; bracteae pallidae subpeltatae molliter pilosae.—El General, Prov. San José, 825 meters, *A. F. Skutch 2920* (type in U. S. Nat. Herb.).

**Piper neurostachyum** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 213. 1891. Juan Viñas, *Pittier 1869*. Tierra caliente of the Atlantic slope.

**Piper nicoyanum** C. DC. Bot. Gaz. 70: 174. 1920. Nicoya, *Tonduz 13689*. Tierra caliente of the Pacific slope, and on the Atlantic slope of Guanacaste.

**Piper nigricaule** Trelease, Contr. U. S. Nat. Herb. 26: 158. 1929. Santo Domingo de Golfo Dulce, *Tonduz 9959*.

**Piper nodosum** C. DC. Bot. Gaz. 70: 185. 1920. Cañas Gordas, *Pittier 11072*.

**Piper nudifolium** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 205. 1891. Río Grande de Térraba, *Pittier 3613*. Valley of Río Diquís.

**Piper obiter-sericeum** Trelease, sp. nov.—Frutex 3-metralis, internodiis floriferis gracilibus et breviusculis primo sericeis; folia elliptica acute acuminata, basi obtusa altero latere longiore, 20–22 cm. longa 10–11 cm. lata, infra medium pinnatinervia, nervis circiter 5+6, supra minute puberula et serius minute granulosa, subtus primo albido-sericea sed cito glabrescentia, petiolo 10+5–20+10 mm. longo; spicae 60 mm. longae 2 mm. crassae, pedunculo 10 mm. longo glabrato; bracteae triangulari-subpeltatae ciliatae; baccae triquetrae truncatae, stigmatibus sessilibus.—In hedgerows, El General, Prov. San José, 880 meters, *A. F. Skutch 2865* (type in U. S. Nat. Herb.).

**Piper oblanceolatum** Trelease, Contr. U. S. Nat. Herb. 26: 175. 1929. Los Ayotes, near Tilarán, Guanacaste, *Standley & Valerio 45558*. Rodeo de Pacaca, *Pittier*.

**Piper oblanceolatum** var. **fragilicaule** Trelease, loc. cit. El Arenal, Atlantic slope, Guanacaste, *Standley & Valerio 45228.*

**Piper obumbratifolium** Trelease, Contr. U. S. Nat. Herb. 26: 134. 1929. Near Tilarán, Guanacaste, 600 meters, *Standley & Valerio 44387.*

**Piper omega** Trelease, Contr. U. S. Nat. Herb. 26: 146. 1929. La Hondura, Prov. San José, 1,300–1,700 meters, *Standley 37800.* Also at Peralta and El Muñeco.

**Piper onus** Trelease, sp. nov.—Ut videtur suffrutex nervis folii subtus minute puberulis exceptis glaber, internodiis floriferis breviusculis crassiusculis; folia elongato-elliptica acuta, basi angustata obtusa, 20–21 cm. longa 9–10 cm. lata, infra medium pinnatinervia, nervis 5–6×2, petiolo 15 mm. longo ad laminam decidue alato; spicae usque 40 mm. longae 5 mm. crassae, apice fragili gracili, pedunculo 15 mm. longo; bracteae subcucullatae; ovarium rotundatum, stylo aequilongo, stigmatibus brevibus.—La Palma de San Ramón, *Brenes 6744* (type in Herb. Field Mus.).

**Piper opacibracteum** Trelease, Contr. U. S. Nat. Herb. 26: 148. 1929. La Tejona, near Tilarán, Guanacaste, 600 meters, *Standley & Valerio 45899.*

**Piper operosum** Trelease, Contr. U. S. Nat. Herb. 26: 141. 1929. Pejivalle, Prov. Cartago, 900 meters, *Standley & Valerio 47135.*

**Piper opinatum** Trelease, sp. nov.—Frutex nanus 60 cm. tantum altus, internodiis floriferis gracilibus breviusculis sparse crispo-villosis; folia oblique sublanceolata falcato-subacuminata, basi fere aequilaterali acuta, 15–18 cm. longa 5–6.5 cm. lata, e 2 tertiis inferioribus pinnatinervia, nervis sursum arcuatis, nervis primariis 5–6×2, sparse adpresse albido-villosa et ad margines dense ciliata, petiolo vix 5 mm. longo villoso; spicae 10 mm. longae 3–4 mm. crassae, pedunculo filiformi 10 mm. longo piloso; bracteae subcucullatae; baccae ovoideae sensim acutatae, stigmatibus 3 sessilibus. —El General, Prov. San José, 950 meters, *A. F. Skutch 2611* (type in U. S. Nat. Herb.).

**Piper oppressum** Trelease, Contr. U. S. Nat. Herb. 26: 161. 1929. Matambú, Península de Nicoya, 600 meters, *Cook & Doyle 697.*

**Piper orosianum** Trelease, Contr. U. S. Nat. Herb. 26: 143. 1929. Orosi, Prov. Cartago, *Standley 39764.*

**Piper otophorum** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 220. 1891. Siquirres, *Pittier 3183*. Also Río Naranjo.

**Piper pablense** Trelease, Contr. U. S. Nat. Herb. 26: 168. 1929. San Pablo de Tarrazú, *Otón Jiménez 1094*.

**Piper pacacanum** Trelease, Contr. U. S. Nat. Herb. 26: 150. 1929. *P. nobile* var. *minus* C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 208. 1891. Rodeo de Pacaca, *Pittier 3239*. Tierra caliente of the Pacific coast.

**Piper pachystylum** Trelease, Contr. U. S. Nat. Herb. 26: 139. 1929. Palmar, Río Grande de Térraba, *Pittier & Tonduz 6717*. Also at Cabagra.

**Piper pallidifolium** C. DC. Bot. Gaz. 70: 176. 1920. Río Ariei, *Pittier 9392*.

**Piper palmanum** Trelease, Contr. U. S. Nat. Herb. 26: 151. 1929. La Palma, Prov. San José, 1,600 meters, *Standley 33112*.

**Piper papillicarpum** Trelease, sp. nov.—Frutex 1.5 m. altus nervis folii subtus obscure puberulis exceptis glaber, internodiis floriferis gracilibus breviusculis fuscescentibus; folia lanceolata sensim acuminata, basi paullo inaequilaterali longiattenuata, 15 cm. longa 4–5 cm. lata, fere ubique pinnatinervia, nervis vix arcuatis circiter 7×2, petiolo 10 mm. longo; spicae 30 mm. longae 7 mm. crassae, pedunculo gracili refracto 5 mm. longo; bracteae subcucullatae; baccae globosae, stylo brevi mammiformi, stigmatibus minutis.—El General, Prov. San José, 975 meters, *A. F. Skutch 2716* (type in U. S. Nat. Herb.).

**Piper papulaecaule** Trelease, sp. nov.—Frutex(?) solemniter nodosus, internodiis brevibus subgracilibus dense minute granulosis; folia aliquanto quadrate lanceolato-elliptica falcate acuto-acuminata, basi inaequilaterali cordulata, 11–14 cm. longa 5–6 cm. lata, infra medium pinnatinervia, nervis 5×2, supra minute lepidota, subtus pallidiora, petiolo circiter 5+2–3 mm. longo; spicae juveniles 35 mm. longae 2 mm. crassae breviter acutatae, pedunculo 10 mm. longo; bracteae rotundo-subpeltatae ciliatae.—Hacienda Santa María, Guanacaste, 720–920 meters, *Dodge & Thomas 6286* in 1929 (type in Gray Herb.).

**Piper papulatum** Trelease, Contr. U. S. Nat. Herb. 26: 163. 1929. Capulín, Río Grande de Tárcoles, 80 meters, *Standley 40181*.

**Piper paulownifolium** C. DC. Anal. Inst. Costa Rica 9: 173. 1897. *P. tiliaefolium* var. *paulownifolium* C. DC. Candollea 1: 154. 1923. La Palma, *Pittier 6739*. A common tree of the Atlantic slope, descending to the coast. Also in Panama.

**Piper pavasense** Trelease, Contr. U. S. Nat. Herb. 26: 173. 1929. Las Pavas, Prov. San José, 900 meters, *Pittier 3188*.

**Piper pejivallense** Trelease, Contr. U. S. Nat. Herb. 26: 171. 1929. Pejivalle, Prov. Cartago, 900 meters, *Standley & Valerio 46727*.

**Piper pelliticaule** Trelease, Contr. U. S. Nat. Herb. 26: 157. 1929. Fraijanes, Prov. Alajuela, 1,600 meters, *Standley & Torres 47539*. Also Río Virilla.

**Piper peltaphyllum** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 220. 1891. Camino de Carrillo, *Pittier 2522*.

**Piper peltaphyllum** var. **lasvueltasanum** C. DC. Bot. Gaz. 70: 172. 1920. Las Vueltas, Tucurrique, *Tonduz 13189*. Also Río Tuis.

**Piper peltatum** L. *Estrella, Santa María. Pothomorphe peltata* Miq. A herbaceous plant about a meter high, abundant almost everywhere in the tierra caliente. Widely distributed in tropical America. Easy of recognition because of its umbellate spikes and large, rounded-cordate, peltate leaves.

**Piper pendens** Trelease, Contr. U. S. Nat. Herb. 26: 160. 1929. Yerba Buena, above San Isidro de Heredia, 2,000 meters, *Standley & Valerio 49822*. A pendent epiphyte.

**Piper pendens** var. **infaustum** Trelease, loc. cit. El Muñeco, Río Navarro, Prov. Cartago, 1,400 meters, *Standley 33651*. A terrestrial shrub.

**Piper pentagonum** Trelease, Contr. U. S. Nat. Herb. 26: 153. 1929. Finca Montecristo, Río Reventazón, Prov. Limón, *Standley & Valerio 48559*.

**Piper pergeniculatum** Trelease, Contr. U. S. Nat. Herb. 26: 172. 1929. Cañas Gordas, *Pittier 11033*.

**Piper perhispidum** C. DC. Bot. Gaz. 70: 183. 1920. Río Barranca, San Juan de San Ramón, *Tonduz 17771*.

**Piper perlongipes** Trelease, Contr. U. S. Nat. Herb. 26: 154. 1929. Pejivalle, Prov. Cartago, 900 meters, *Standley & Valerio 46834*. Also at Tuis and Shirores.

**Piper perpuberulum** Trelease, Contr. U. S. Nat. Herb. 26: 146. 1929. Talamanca, *Pittier & Tonduz 8690.* Also at La Verbena, near San José.

**Piper pertractatum** Trelease, Contr. U. S. Nat. Herb. 26: 130. 1929. Nuestro Amo, Alajuela, *Otón Jiménez.* Collected also at Rodeo de Pacaca, Tilarán, and Río Febas, San Juan.

**Piper pexum** Trelease, Contr. U. S. Nat. Herb. 26: 140. 1929. Río Blanco near El Copey, Prov. San José, 1,800 meters, *Standley 41887.*

**Piper phanerolepidum** Trelease, Contr. U. S. Nat. Herb. 26: 182. 1929. El Muñeco, Río Navarro, Prov. Cartago, 1,400 meters, *Standley 33570.* Known only from the region of El Muñeco.

**Piper phaneropus** Trelease, sp. nov.—Frutex glaber 3-metralis, ramulis in sicco pallidis, internodiis modice brevibus et gracilibus; folia lanceolato-elliptica aliquanto falcate acuminata, basi angustata inaequilateralia, altero latere acuta altero brevi-auriculata, 18–23 cm. longa 7–9 cm. lata, infra medium pinnatinervia, nervis circiter 6+7, in sicco tenuia, subtus pallidiora, petiolo circiter 8+2 mm. longo granuloso; spicae 75 mm. longae 3–4 mm. crassae, pedunculo gracili 10 mm. longo; bracteae subcrescenticae; baccae teretes convallatae, stigmatibus 3 sessilibus.—Santa María de Dota, 1,980 meters, *H. E. Stork 1775* (type in herb. Univ. Illinois).

**Piper piedadesense** Trelease, sp. nov.—Frutex glaber 2-metralis, internodiis subgracilibus breviusculis; folia elongato-elliptica subabrupte acuto-acuminata, basi auriculata, sinu clauso, auricula longiore petiolum aequante et occultante, 25–30 cm. longo 12–14 cm. lata, e medio inferiore vel paullo altius pinnatinervia, nervis circiter 6+8, petiolo 4 cm. longo late alato; spicae subgraciles (5 mm. crassae) et in sicco viso modice elongatae; bracteae rotundo-peltatae glabratae.—Colinas de Piedades de San Ramón, 1,000 meters, *Brenes 5483* (type in Herb. Field Mus.).

**Piper pileatum** Trelease, Contr. U. S. Nat. Herb. 26: 184. 1929. El Copey, Prov. San José, *Tonduz 11895.* Cantón de Dota to the Pacific coast. Reported under the name *P. Burenii.*

**Piper pileatum** var. **obliquum** Trelease, loc. cit. El Copey, *Tonduz 11675.*

**Piper pilibaccum** C. DC. Bot. Gaz. 70: 179. 1920. Matambú, Península de Nicoya, *Cook & Doyle 702.*

**Piper Pittieri** C. DC. Bull. Soc. Bot. Belg. 29, pt. 2: 69. 1890. Between Turrialba and Río Birrís, 2,400 meters, *Pittier 376*. Slopes of the central volcanoes, ascending to 3,000 meters. Noted by Pittier as being the *Piper* that reaches a higher elevation in Costa Rica than any other member of the genus.

**Piper playa-blancanum** Trelease, sp. nov.—Frutex nodosus glaber, internodiis brevibus graciusculis pallidis; folia lanceolata sensim gracili-acuminata, basi paullo inaequilaterali rotundata, 12–14 cm. longa 3.5–4 cm. lata, fere ubique pinnatinervia, nervis 6–7×2, in sicco papyracea, petiolo vix 5 mm. longo; spicae 20–30 mm. longae 2 mm. crassae, pedunculo vix 5 mm. longo.—Playa Blanca, Golfo Dulce, at sea level, *Manuel Valerio 319* (type in Herb. Field Mus.). Also No. 311 from the same locality.

**Piper poasanum** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 206. 1891. Volcán de Poás, *Pittier 2386*. Slopes of the volcanoes and at La Estrella de Cartago.

**Piper polytrichum** C. DC. Candollea 1: 110, 270. 1923. Cañas Gordas, *Pittier 11070*.

**Piper ponendum** Trelease, sp. nov.—Frutex 1.5–2 m. altus, internodiis floriferis brevibus modice gracilibus subtomentosis; folia rhombeo-obovata subabrupte acuminata, basi plus minusve cordulata latere altero paullo breviore, 17–20 cm. longa 7.5–11 cm. lata, infra medium pinnatinervia, nervis 6+7, supra breviter adpresso-pubescentia, subtus ad nervos subtomentulosa, petiolo 5–10+5 mm. longo molliter hirsuto; spicae in sicco viso breves mucronatae breviter pedunculatae.—Roadside south of Heredia, 1,100 meters, *Brenes 13244* (type in Herb. Field Mus.).

**Piper prismaticum** C. DC. Linnaea 37: 342. 1872. *P. turrialvanum* C. DC. loc. cit. (Turrialba, *Oersted 901*). Turrialba, *Oersted 886*. In forest at middle elevations on the Atlantic slope; region of San Ramón.

**Piper prismaticum** var. **magnifolium** (C. DC.) Trelease, Contr. U. S. Nat. Herb. 26: 135. 1929. *P. turrialvanum* var. *magnifolium* C. DC. Anal. Inst. Costa Rica 9: 160. 1897. Río Naranjo, *Tonduz 7642*. Tierra caliente of the Atlantic slope.

**Piper prismaticum** var. **tilaranum** Trelease, loc. cit. La Tejona, near Tilarán, Guanacaste, 600 meters, *Standley & Valerio 45767*.

**Piper prismaticum** var. **villosulum** Trelease, loc. cit. Finca Montecristo near El Cairo, Prov. Limón, *Standley & Valerio 48570.*

**Piper pseudo-aduncum** C. DC. Anal. Inst. Costa Rica 9: 166. 1897. Puerto Viejo, Río Sarapiquí, *Biolley 6914.*

**Piper pseudo-albuginiferum** Trelease, Contr. U. S. Nat. Herb. 26: 165. 1929. El Muñeco, Río Navarro, Prov. Cartago, 1,500 meters, *Standley & Valerio 50948.*

**Piper pseudobumbratum** C. DC. Anal. Inst. Costa Rica 9: 171. 1897. El Muelle, Río Sarapiquí, *Biolley 7438.*

**Piper pseudodilatatum** C. DC. Anal. Inst. Costa Rica 9: 165. 1897. Punta Mala, *Tonduz 6797.*

**Piper pseudo-fimbriulatum** Trelease, Contr. U. S. Nat. Herb. 26: 153. 1929. El General, 600 meters, *Pittier 3601.* Also between Boruca and Térraba.

**Piper pseudofuligineum** C. DC. Linnaea 37: 355. 1872. Cerro de Candelaria, *Oersted 887.* Region of San Ramón.

**Piper pseudo-glabrifolium** Trelease, Contr. U. S. Nat. Herb. 26: 150. 1929. Santa María de Dota, *Tonduz 7853.* Reported under the name *P. glabrifolium.*

**Piper pseudo-lanceaefolium** Trelease, Contr. U. S. Nat. Herb. 26: 170. 1929. La Palma, Prov. San José, 1,450 meters, *Tonduz 12665.* Mountains of the central region. Reported for Costa Rica under the name *P. lanceaefolium.*

**Piper pseudopropinquum** C. DC. Linnaea 37: 341. 1872. Turrialba, *Oersted 820.* Mountains of the central region.

**Piper pseudopsis** C. DC. Anal. Inst. Costa Rica 9: 164. 1897. San José, *Tonduz 1088.* A common shrub of the central region. Listed for Costa Rica under the name *P. Bredemeyeri.*

**Piper pubinerve** C. DC. Bot. Gaz. 70: 172. 1920. El General, *Pittier 10607.*

**Piper pullibracteatum** Trelease, Contr. U. S. Nat. Herb. 26: 182. 1929. *Cordoncillo.* La Estrella, Prov. Cartago, *Standley 39236.* Also Cerro de La Carpintera. A shrub 2.5 meters high.

**Piper punctiunculatum** Trelease, Contr. U. S. Nat. Herb. 26: 180. 1929. *Cordoncillo.* Tilarán, Guanacaste, 600 meters, *Standley & Valerio 45712.* Region of Tilarán. A shrub of 2.5 meters.

**Piper pustulicaule** Trelease, sp. nov.—Frutex nodosus 3-metralis nervis folii subtus microscopice puberulis exceptis glaber, internodiis brevibus modice crassis in sicco dense pustulatis; folia elliptica acuminata, basi inaequilaterali acuta, 15–16 cm. longa 5.5–6.5 cm. lata, infra medium pinnatinervia, nervis 5×2, petiolo 10 mm. longo; spicae 95 mm. longae 4 mm. crassae, pedunculo 5 mm. longo; bracteae parvae pallidae zonatae subpeltatae; baccae subtriquetrae truncatae; stigmata sessilia.—El General, Prov. San José, 1,190 meters, *A. F. Skutch 2938* (type in U. S. Nat. Herb.).

**Piper quebradense** Trelease, sp. nov.—Frutex ubique subtransiente laxe villosus, internodiis floriferis breviusculis crassiusculis subsparse verruculosis; folia obovata breviacuminata, basi inaequaliter auriculata, sinu laterali clauso, auricula longiore rotundata petiolum occultante et subaequante, infra medium pinnatinervia, nervis circiter 6+8 sicut venis majoribus supra impressis, subtus salientibus, petiolo circiter 4 cm. longo anguste alato; spicae 150 mm. longae 5 mm. crassae, pedunculo 2 cm. longo; bracteae fimbriatae.—Quebrada Honda, Piedades Sur, San Ramón, *Brenes 5843* (type in Herb. Field Mus.).

**Piper rectamentum** Trelease, Contr. U. S. Nat. Herb. 26: 180. 1929. El Arenal, Atlantic slope, Guanacaste, 500 meters, *Standley & Valerio 54237*.

**Piper recuperatum** Trelease, Contr. U. S. Nat. Herb. 26: 132. 1929. Santo Domingo de Golfo Dulce, *Tonduz 9927*. Listed for Costa Rica under the name *P. medium*.

**Piper reptabundum** C. DC. Bot. Gaz. 70: 169. 1920. Shirores, Talamanca, *Tonduz 9277*.

**Piper reticulatum** L. *P. smilacifolium* HBK.; *P. discophorum* C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 201. 1891 (Surubres, San Mateo, *Biolley 4047*). A common shrub almost everywhere in the tierra caliente. Guatemala to Peru and Brazil.

**Piper reventazonis** Trelease, Contr. U. S. Nat. Herb. 26: 172. 1929. Juan Viñas, 1,000 meters, *Cook & Doyle 306*.

**Piper rhodostachyum** Trelease, Contr. U. S. Nat. Herb. 26: 158. 1929. Río Reventazón, *Lankester 1163*.

**Piper riparense** C. DC. Anal. Inst. Costa Rica 9: 173. 1897. Río Hacúm, Buenos Aires, *Tonduz 4893*.

**Piper ripense** C. DC. Anal. Inst. Costa Rica 9: 169. 1897. Puerto Viejo, *Biolley 7444.*

**Piper ripicola** C. DC. Anal. Inst. Costa Rica 9: 171. 1897. Río Coto, Golfo Dulce, *Pittier 9988.*

**Piper rotundibaccum** Trelease, Contr. U. S. Nat. Herb. 26: 164. 1929. *Cordoncillo.* Quebradillas, near Santa María de Dota, 1,800 meters, *Standley 42902.* Regions of Santa María and San José. A shrub of 1–1.5 meters.

**Piper rubripes** Trelease, sp. nov.—Frutex(?), ramis gracilibus viridibus ad nodos paullo granulosis, primo rubescentibus, internodiis subgracilibus et aliquanto elongatis; folia lanceolata, superiora ovata, falcate acuminata, basi inaequilaterali subcordulata, 15 cm. longa 5–7 cm. lata, e tertio infimo pinnatinervia, nervis circiter 4×2, glabra, supra aliquanto glanduloso-granulosa sed vix asperata, petiolo 10 mm. longo obscure granuloso rubescente; spicae 100 mm. longae 3 mm. crassae interdum cuspidatae, pedunculo 15 mm. longo subpapilloso rubro; bracteae rotundo-subpeltatae ciliolatae.—Upper slopes of Cerro San José de Líbano, Guanacaste, 500–960 meters, *Dodge, Hanckel & Thomas 6382* in 1930 (type in Gray Herb.; duplicate in Herb. Field Mus.). Also in the region of San Ramón.

**Piper rubrospadix** Trelease, sp. nov.—Frutex(?), internodiis floriferis modice gracilibus et brevibus sed cito elongatis glabris rubris; folia anguste elliptica breviter acuminata, basi subinaequilaterali subacuta vel altero latere rotundata, 15–16 cm. longa 6–6.5 cm. lata, infra medium vel tertium supremum pinnatinervia, nervis 5–6×2, subtus incurvo-pilosa, petiolo 10 mm. longo vaginante dorso piloso; spicae 35–40 mm. longae 4–5 mm. crassae aliquanto cuspidatae rubrae, pedunculo circiter 8 mm. longo rubro; bracteae crescentico-subpeltatae.—Bonilla Lakes, Prov. Limón, 300–430 meters, *Dodge, Catt & Thomas 5718* in 1929 (type in Gray Herb.; duplicate in Herb. Field Mus.).

**Piper rufescens** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 218. 1891. *P. nemorense* C. DC. op. cit. 222 (Juan Viñas, *Tonduz 1849*). Juan Viñas, *Tonduz 1850.* Middle or high elevations of the Atlantic slope. Reported under the name *P. marequitense.*

**Piper rugosifolium** Trelease, Contr. U. S. Nat. Herb. 26: 185. 1929. *Cordoncillo.* Finca Las Cóncavas, Prov. Cartago, *Standley 41533.* Mountains of the central region. Reported under the name *P. hirsutum* var. *pallescens.* A shrub 2 meters high.

**Piper sagittifolium** C. DC. Anal. Inst. Costa Rica 9: 171. 1897. Río Naranjo, *Tonduz 7588*. Also valley of Aguas Buenas. Nicaragua.

**Piper salinasanum** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 214. 1891. Bahía de Salinas, *Pittier 2775*. Pacific coast.

**Piper salutatrix** Trelease, sp. nov.—Frutex 2-metralis, internodiis floriferis brevibus graciusculis transiente niveo-sericeis; folia subrhombea falcato-acuminata, basi rotundata vel obscure cordulata latere altero breviore, 12–15 cm. longa 5–6.5 cm. lata, infra medium pinnatinervia, nervis circiter 5+6, supra minute pubescentia, nervis primo albo-sericeis, subtus primo albo-sericea serius subglabrescentia, petiolo circiter 8+2 mm. longo molliter piloso; spicae 60 mm. longae 2 mm. crassae, pedunculo 10 mm. longo albo-sericeo.—El General, Prov. San José, 880 meters, *A. F. Skutch 2504* (type in U. S. Nat. Herb.).

**Piper san-cristobalanum** Trelease, sp. nov.—Arbor montana glabrata 5-metralis et ultra, ramulis crassiusculis subelongatis; folia late ovata subobtusa, basi subtruncate breviter cordata, 23–26 cm. longa 15–20 cm. lata, infra medium multiplinervia, nervis circiter 6×2, subtus crispo-puberula, venoso-areolata, in sicco firma, praesertim subtus brunnescentia et lucida, petiolo 8 cm. longo alato; spicae juveniles 10 mm. longae 6 mm. crassae uncatae, pedunculo gracili 3 cm. longo; bracteae rotundo-subpeltatae umbonatae, margine angustato ciliato.—San Cristóbal Road, 2,400 meters, *H. E. Stork 2205* (type in herb. Univ. Illinois).

**Piper sandaloense** Trelease, sp. nov.—Frutex humilis glaber glanduloso-punctulatus, internodiis modice brevibus et gracilibus; folia late elliptica breviter acuminata, basi paullo inaequilaterali altero latere decurrentia, 15–20 cm. longa 7–10 cm. lata, infra medium pinnatinervia, nervis 5×2, petiolo 2–5 cm. longo alato; spicae fere 40 mm. longae et 3 mm. crassae, pedunculo vix 5 mm. longo.—Río Sándalo, Península de Osa, at sea level, *Dodge & Goerger 10076* (type in herb. Mo. Bot. Gard.).

**Piper san-joseanum** C. DC. Linnaea 37: 351. 1872. Cerro de Aguacate, *Oersted 893*. A common species of the Pacific slope, ascending to the Meseta Central; region of San Ramón. Reported under the name *P. marginatum*.

**Piper san-joseanum** var. **minus** Trelease, Contr. U. S. Nat. Herb. 26: 133. 1929. Nicoya, *Tonduz 13695*.

**Piper san-marcosanum** C. DC. Anal. Inst. Costa Rica 9: 158. 1897. San Marcos, Prov. San José, *Tonduz 7557*. Also on the slopes of Volcán Poás.

**Piper scalpens** Trelease, Contr. U. S. Nat. Herb. 26: 176. 1929. San José, *Tonduz 10154*. Reported as *P. hirsutum* var. *parvifolium*.

**Piper scintillans** Trelease, Contr. U. S. Nat. Herb. 26: 179. 1929. *Cordoncillo*. Finca Hamburgo, Río Reventazón, Prov. Limón, *Standley & Valerio 48828*. Atlantic coast. A shrub 2 meters high.

**Piper scleromyelum** C. DC. Anal. Inst. Costa Rica 9: 167. 1897. Tsuritkub, Talamanca, *Tonduz 8675*.

**Piper seductum** Trelease, Contr. U. S. Nat. Herb. 26: 135. 1929. Madre de Dios, 50 meters, *Pittier 10308*.

**Piper sepicola** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 202. 1891. Turrialba, *Tonduz 4114*.

**Piper sesquimetrale** Trelease, sp. nov.—Suffrutex essentialiter glaber 1.2 m. altus, internodiis floriferis brevibus crassiusculis; folia late ovata subacuta basi rotundata, 12–18 cm. longa 10–13 cm. lata, multiplinervia, paribus nervorum basalium 4, pare altero prope medium folii nascente, in sicco celluloso-papillosa, petiolo 10–20 mm. longo vaginante; spicae 50 mm. longae 5 mm. crassae, pedunculo 5 mm. longo; bracteae inconspicuae subcucullatae; baccae rotundatae vel triquetrae, stigmatibus sessilibus.—El General, Prov. San José, 850 meters, *A. F. Skutch 2314* (type in U. S. Nat. Herb.).

**Piper signatum** Trelease, Contr. U. S. Nat. Herb. 26: 152. 1929. El Muñeco, Río Navarro, Prov. Cartago, 1,400 meters, *Standley & Valerio 50958*. Known only from the type region.

**Piper silencioi** Trelease, sp. nov.—Suffrutex glaber vix 2-metralis, internodiis floriferis gracilibus brevibus; folia subovato-lanceolata subacuta, basi paullo inaequilaterali acuta vel subacuta, 12–16 cm. longa 5–6 cm. lata, infra medium pinnatinervia, nervis circiter 4×2, petiolo 5–10 mm. longo concavo; spicae 40 mm. longae 4 mm. crassae breviter apiculatae, pedunculo 5 mm. longo.—El Silencio, Guanacaste, 750 meters, *Standley & Valerio 44644* (type in U. S. Nat. Herb.), *44656;* also in the same general region, *No. 45053*.

**Piper silvanorum** Trelease, Contr. U. S. Nat. Herb. 26: 169. 1929. Las Nubes, Prov. San José, 1,500–1,900 meters, *Standley 38500*. Also on the slopes of Volcán de Barba.

**Piper silvicola** C. DC. Anal. Inst. Costa Rica 9: 159. 1897. Río Naranjo, *Tonduz 7611.*

**Piper silvivagum** C. DC. Anal. Inst. Costa Rica 9: 162. 1897. Mouth of Río Zhorquín, *Tonduz 8595.* Also at Shirores and Tuis.

**Piper simulans** Trelease, sp. nov.—Frutex aspectu *P. candelario* similis aliquanto nodosus glaber, internodiis floriferis modicis fusces-centibus; folia lanceolata sensim attenuata, basi paullo inaequi-laterali acuta, 9–13 cm. longa 3–4.5 cm. lata, e 2 tertiis inferioribus vel inferius pinnatinervia, nervis validioribus circiter 5×2 sed con-fluentibus, aliis obscurioribus e parte suprema costae nascentibus, subtus glanduloso-granulosa, petiolo 5–7+3 mm. longo exalato; spicae 20 mm. longae 5 mm. crassae obscure mucronatae, pedunculo 1 cm. longo subrecurvo; baccae ovoideae apice contractae, stigmati-bus 3 magnis.—Changuinola Valley, Province of Bocas del Toro, Panama, near the Costa Rican boundary, *V. C. Dunlap 459* (type in Herb. Field Mus.).

**Piper sinuatifolium** Trelease, Contr. U. S. Nat. Herb. 26: 147. 1929. Los Ayotes, near Tilarán, Guanacaste, 600 meters, *Standley & Valerio 45537.*

**Piper sinugaudens** C. DC. Bot. Gaz. 70: 188. 1920. Buena Vista, *Cook & Doyle 150.*

**Piper siquirresense** Trelease, sp. nov.—Frutex(?) nodosus, internodiis floriferis subgracilibus breviusculis, serius elongatis, primo breviter crispo-puberulis; folia elliptica subacute acuminata, basi paullo inaequilaterali angustata et vulgo saltem latere longiore subobtusa, 14–18 cm. longa 6.5–8 cm. lata, infra medium pinnati-nervia, nervis circiter 5×2, in sicco tenuia, subtus sparse incurvo-pubescentia, petiolo circiter 10+1 mm. longo breviter pubescente; spicae 60 mm. longae et ultra 4–5 mm. crassae, pedunculo 5 mm. longo serius incrassato; bracteae rotundo-subpeltatae fimbriatae.—Siquirres, 300 meters, *H. E. Stork 2251* (type in herb. Univ. Illinois).

**Piper spicilongum** Trelease, Contr. U. S. Nat. Herb. 26: 177. 1929. Santo Domingo de Golfo Dulce, *Tonduz 9962.* Also at Surubres, San Mateo.

**Piper squalidum** Trelease, sp. nov.—Frutex(?), internodiis floriferis breviusculis subgracilibus subtomentulosis; folia elliptica sensim acutata, basi subauriculata, sinu basali, auriculis valde inaequalibus, longiore medium petioli vaginantis subtomentulosi

aequante, 20 cm. longa 9 cm. lata (interdum multo majora?), infra medium pinnatinervia, nervis circiter 5+4, subtus praesertim ad nervos crispo-pubescentia, petiolo circiter 3 cm. longo subtomentuloso; inflorescentia?—Cataratas de San Ramón, *Brenes 13416* (type in Herb. Field Mus.).

**Piper squali-pelliculum** Trelease, Contr. U. S. Nat. Herb. 26: 178. 1929. *P. salinasanum* var. *subscabrifolium* C. DC. Anal. Inst. Costa Rica 9: 164. 1897. Río Virilla, San José, *Tonduz 10126*. Region of San José and at La Palma de San José.

**Piper stenocladophorum** Trelease, Contr. U. S. Nat. Herb. 26: 168. 1929. Turrialba, *Tonduz 8316*.

**Piper stenocladum** C. DC. Anal. Inst. Costa Rica 9: 162. 1897. Boruca, *Tonduz 6747* ex parte.

**Piper striatum** C. DC. Linnaea 37: 345. 1872. *P. littorale* C. DC. Anal. Inst. Costa Rica 9: 165. 1897 (Talamanca, *Tonduz 8736*). Collected at various localities in the coasts; region of San Ramón. Also in Nicaragua.

**Piper subasperatum** Trelease, sp. nov.—Frutex 3-metralis, internodiis floriferis brevibus gracilibus griseo-hispidis; folia oblique lanceolata vel elliptica falcato-acuminata, basi oblique acuta vel subacuta, 10–14 cm. longa 3.5–5.5 cm. lata, infra medium pinnatinervia, nervis tenuibus circiter 4+5, supra granuloso-scabrida, subtus ad nervos substrigosa, petiolo circiter 5 mm. longo hispido; spicae circiter 125 mm. longae 3 mm. crassae, pedunculo 10 mm. longo glabrescente; bracteae rotundo-subpeltatae pilosae.—El General, Prov. San José, 915 meters, *A. F. Skutch 2157* (type in U. S. Nat. Herb.).

**Piper subaspericaule** C. DC. Anal. Inst. Costa Rica 9: 162. 1897. *P. trichocladum* C. DC. op. cit. 167. Río Naranjo, *Tonduz 7625*. Both species were based upon the same collection by Tonduz.

**Piper subdivaricatum** Trelease, Contr. U. S. Nat. Herb. 26: 163. 1929. La Hondura, Prov. San José, 1,500 meters, *Standley 36489*.

**Piper subdurum** Trelease, sp. nov.—Frutex nodosus ramosus glaber 5-metralis, internodiis subgracilibus brevissimis; folia ovata sensim longiattenuata, basi acuta, circiter 10 cm. longa atque 4 cm. lata, e tertio infimo pinnatinervia, nervis circiter 3×2 supra impressis, subtus salientibus, in sicco plicata, tenuia sed firme papyracea et

lucida, petiolo 5 mm. longo; spicae 70 mm. longae 4 mm. crassae, pedunculo 5 mm. longo; baccae rotundatae, stigmatibus sessilibus. —El General, Prov. San José, 1,560 meters, *A. F. Skutch 2993* (type in U. S. Nat. Herb.).

**Piper suberythrocarpum** C. DC. Anal. Inst. Costa Rica 9: 160. 1897. Río Naranjo, *Tonduz 7550*. Also in Nicaragua.

**Piper subfuscum** C. DC. Journ. Bot. 4: 217. 1866. *P. tablazosense* C. DC. Bot. Jahrb. 10: 288. 1888 (El Tablazo, *Lehmann 1752*). Alto de La Cruz, Cerro de Candelaria, *Hoffmann 544*. Region of San Ramón, at 1,200 meters. A shrub of 1.5–2 meters.

**Piper subhirsutum** Trelease, Contr. U. S. Nat. Herb. 26: 179. 1929. *Cordoncillo*. Finca La Colombiana, Prov. Limón, *Standley 36642*. Also at Limón. A shrub of 2 meters.

**Piper subhirsutum** var. **tomentosicaule** Trelease, loc. cit. At the same locality as the type of the species, *Standley 36821*.

**Piper sublaevifolium** Trelease, Contr. U. S. Nat. Herb. 26: 147. 1929. *P. laevifolium* C. DC. Anal. Inst. Costa Rica 9: 169. 1897, non Blume. Boca de Zhorquín, Talamanca, *Tonduz 8586*.

**Piper sublineatum** Kuntze, Rev. Gen. 2: 565. 1891. *P. Biolleyi* C. DC. Bull. Bot. Soc. Belg. 30, pt. 1: 210. 1891 (Camino de Carrillo, *Tonduz 2529*). Angostura, *Kuntze*. A common species of the tierra caliente of both coasts, ascending to El Muñeco.

**Piper submolle** Trelease, Contr. U. S. Nat. Herb. 26: 178. 1929. El Carmen, Prov. Limón, *Standley & Valerio 48363*.

**Piper submultiplinerve** C. DC. Bot. Gaz. 70: 184. 1920. Valle de Los Arcángeles, Volcán de Irazú, *Pittier 13626*. Also at San Pablo de Tarrazú.

**Piper subquadratum** Trelease, Contr. U. S. Nat. Herb. 26: 174. 1929. Río Ariei, Talamanca, *Tonduz 9387* ex parte. Also at Tsaki, Puerto Viejo, and La Palma.

**Piper subquinquenerve** Trelease, sp. nov.—Frutex(?) nodosus, internodiis floriferis brevibus gracilibus; folia lanceolata acuminata basi acuta 8–10.5 cm. longa 2.5–3 cm. lata, e 2 tertiis inferioribus subpinnatim 7-nervia, nervis 4 inferioribus prope basin nascentibus longe adscendentibus, in sicco tenuia opaca, nervis subtus aurantiacis, petiolo 5–12 mm. longo exalato; spicae juveniles 35 mm. longae 2 mm. crassae, pedunculo gracili fere 2 mm. longo; bracteae minutae rotun-

do-subpeltatae.—Changuinola Valley, Province of Bocas del Toro, Panama, near the Costa Rican border, *V. C. Dunlap 452* (type in Herb. Field Mus.).

**Piper subsericeum** Trelease, Contr. U. S. Nat. Herb. 26: 141. 1929. Finca Montecristo near El Cairo, Prov. Limón, *Standley & Valerio 48636*.

**Piper subsessilifolium** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 216. 1891. *P. subsessilifolium* var. *palmanum* C. DC. Bot. Gaz. 70: 183. 1920 (La Palma, *Tonduz 12662*). Río Navarrito, *Pittier 2436*. At middle elevations in the central region; region of San Ramón.

**Piper subvariabile** Trelease, Contr. U. S. Nat. Herb. 26: 145. 1929. Tilarán, Guanacaste, 500 meters, *Standley & Valerio 44970*. Region of Tilarán.

**Piper subzhorquinense** C. DC. ex Trelease, Contr. U. S. Nat. Herb. 26: 142. 1929. Cañas Gordas, 1,100 meters, *Pittier 11029*.

**Piper sulcinervosum** Trelease, Contr. U. S. Nat. Herb. 26: 159. 1929. *Cordoncillo*. Cerro de La Carpintera, Prov. Cartago, 1,500–1,800 meters, *Standley 35569*. Region of Cartago. A shrub 2 meters high.

**Piper surubresanum** Trelease, Contr. U. S. Nat. Herb. 26: 148. 1929. *Cordoncillo*. Río Surubres, San Mateo, *Biolley 17353*. Also in Guanacaste. A shrub 1.5 meters high.

**Piper tabanicidum** Trelease, Contr. U. S. Nat. Herb. 26: 162. 1929. *Cordoncillo*. Tilarán, Guanacaste, 600 meters, *Standley & Valerio 45676*. Region of Tilarán. It is reported that the fruits are employed for curing the sores in cattle and horses caused by grubs.

**Piper Tacamahaca** Trelease, Contr. U. S. Nat. Herb. 26: 144. 1929. La Ventolera, slopes of Poás, 1,700 meters, *Standley 34578a*. Slopes of Volcán Poás and Cerro de La Carpintera.

**Piper tacaresense** Trelease, sp. nov.—Frutex(?) glaber nodosus, internodiis floriferis crassiusculis subelongatis in sicco pallidis; folia elliptica acuminata basi oblique cordulata 16–17 cm. longa 7–8 cm. lata, infra medium pinnatinervia, nervis 5×2, petiolo vix 5 mm. longo latere longiore laminae occulto; spicae rectae vel plus minusve curvae 75 mm. longae 3 mm. crassae, pedunculo 5–10 mm. longo.—Tacares, 800 meters, *Manuel Valerio* 302 (type in Herb. Field Mus.).

**Piper talamancanum** Trelease, Contr. U. S. Nat. Herb. 26: 173. 1929. Shirores, Talamanca, 100 meters, *Tonduz 9274*. Also Río Zhorquín and Siquirres. Reported from Costa Rica under the name *P. hirsutum* var. *pallens*.

**Piper tarrazuense** Trelease, Contr. U. S. Nat. Herb. 26: 142. 1929. San Pablo de Tarrazú, *Otón Jiménez 1095*.

**Piper tentatum** Trelease, sp. nov.—Frutex(?), internodiis floriferis breviusculis subgracilibus hispidis; folia elliptica vel lanceolato-elliptica acuminata, basi subinaequilaterali acuta, 18–20 cm. longa 6.5–7 cm. lata, e 2 tertiis inferioribus pinnatinervia, nervis 5–6×2, supra granuloso-scabrida, subtus ad nervos hispida, petiolo circiter 5 mm. longo hispido; spicae juveniles vix 40 mm. longae 3 mm. crassae, pedunculo 5 mm. longo scabrido.—San Pedro de San Ramón, *Brenes 15032* (type in Herb. Field Mus.).

**Piper tenuipes** C. DC. Bot. Gaz. 70: 174. 1920. San Ramón, *Brenes 14193*. A common species of the Pacific coast; Guanacaste. Reported under the name *P. medium*.

**Piper tenuispicum** C. DC. Bot. Gaz. 70: 170. 1920. *Hoja de calentura*. Trejos, Las Vueltas, Tucurrique, *Tonduz 13187*. Also at Juan Viñas.

**Piper terminalispicum** Standl., nom. nov. *Sarcorhachis anomala* Trelease, Contr. U. S. Nat. Herb. 26: 118. 1929. La Hondura, Prov. San José, *Standley 37909*. A species distinguished by its terminal spikes. A small vine.

**Piper terrabanum** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 217. 1891. Térraba, *Tonduz 3604*. Also at Boruca, Rodeo de Pacaca, and Palmar; region of San Ramón.

**Piper terronesense** Trelease, sp. nov.—Frutex(?) nodosus glaber copiose sed minute glanduloso-granulosus, internodiis floriferis subgracilibus subbrevibus sed serius elongatis; folia late ovata et basi rotundata sed in petiolum abrupte angustata, vel elliptica et sensim basi acutata, acuta vel breviter acuminata, 12–17 cm. longa 7–12 cm. lata, infra medium multiplinervia, nervis 4–5×2, petiolo 2–5 cm. longo concavo, petiolis longioribus infra medium alatis; spicae 30–40 mm. longae 3 mm. crassae, pedunculo 10 mm. longo; bracteae crescenticae; stigmata 3 brevia subconfluentia.—Mouth of Río Terrones, Prov. Puntarenas, *C. W. Dodge 7749* in 1930 (type in Gray Herb.).

**Piper tilaranum** Trelease, Contr. U. S. Nat. Herb. 26: 131. 1929. *Cordoncillo.* Tilarán, Guanacaste, 600 meters, *Standley & Valerio 46596.* Region of Tilarán. A shrub of 2.5–3.5 meters.

**Piper tinctum** Trelease, Contr. U. S. Nat. Herb. 26: 153. 1929. Los Ayotes, near Tilarán, 600 meters, *Standley & Valerio 45460.* Region of Tilarán.

**Piper Tonduzii** C. DC. Anal. Inst. Costa Rica 9: 170. 1897. *P. nanum* C. DC. Bot. Gaz. 70: 180. 1920 (Guácimo, *Tonduz 14659*). Shirores, Talamanca, *Pittier 9280.* Tierra caliente of the Atlantic slope.

**Piper Tonduzii** var. **semiherbaceum** Trelease, Contr. U. S. Nat. Herb. 26: 143. 1929. Quebrada Serena, near Tilarán, Guanacaste, 700 meters, *Standley & Valerio 46261.* Region of Tilarán.

**Piper torresanum** Trelease, Contr. U. S. Nat. Herb. 26: 177. 1929. Río Torres, San Francisco de Guadalupe, 1,170 meters, *Tonduz & Pittier 8971.* Listed under the name *P. hirsutum* var. *pallescens.*

**Piper tortuosipilum** Trelease, Contr. U. S. Nat. Herb. 26: 148. 1929. El Muñeco, Río Navarro, Prov. Cartago, 1,400 meters, *Standley & Valerio 51026.* Region of Cartago and La Hondura de San José. A shrub 1 meter high.

**Piper tractifolium** Trelease, Contr. U. S. Nat. Herb. 26: 166. 1929. Cerro de Las Caricias above San Isidro de Heredia, 2,200 meters, *Standley & Valerio 52052.* Slopes of Volcán de Barba.

**Piper tractifolium** var. **pubescens** Trelease, loc. cit. La Palma de San José, *Pittier 736.*

**Piper trichophlebium** Trelease, Contr. U. S. Nat. Herb. 26: 177. 1929. *P. hirsutum* var. *Tonduzii* C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 203. 1891. Aserrí, *Tonduz 1270.* Mountains of the Meseta Central.

**Piper trimetrale** C. DC. Anal. Inst. Costa Rica 9: 159. 1897. Río Tuis, *Tonduz 8169.*

**Piper triquetrofructum** Trelease, sp. nov.—Frutex(?), internodiis floriferis brevibus gracilibus, juvenilibus aliquanto brevipubescentibus; folia late lanceolata falcate acuto-acuminata, basi rotundata latere altero paullo breviore, 20 cm. longa 7 cm. lata, infra medium pinnatinervia, nervis circiter 5×2, supra minute

granulosa, subtus ad nervos sparse sericea, aliquanto rugescentia, petiolo 10 mm. vel 8+2 mm. longo subpersistente molliter pubescente; spicae 70 mm. longae 3 mm. crassae, pedunculo 10 mm. longo; bracteae triangulari-subpeltatae; baccae trigonae truncatae, stigmatibus 3 sessilibus.—Río Pejivalle gorge, Prov. Cartago, 600–650 meters, *Dodge & Thomas 4431* in 1929 (type in Gray Herb.).

**Piper tsuritkubense** Trelease, Contr. U. S. Nat. Herb. 26: 174. 1929. Tsuritkub, Talamanca, *Tonduz 8616*. Plains of the Atlantic coast. Reported from Costa Rica under the name *P. hirsutum* var. *magnifolium*.

**Piper tuberculatum** Jacq. *Cordoncillo*. Common almost everywhere on the Pacific slope, and reaching Cartago. A species of wide distribution in Central and South America. In some parts of Central America this shrub is planted to form hedges, for which it serves well, since it branches densely when trimmed. Trelease refers the Costa Rican plant to var. *minus* C. DC.

**Piper tuisanum** C. DC. Anal. Inst. Costa Rica 9: 163. 1897. Río Tuis, *Pittier 8073*.

**Piper umbellatum** L. *Estrella, Santa María, Cordoncillo*. *Pothomorphe umbellata* Miq. Common almost everywhere in the tierra caliente, ascending to the Meseta Central. A species of wide distribution in tropical America. Plants herbaceous or sometime shrubby, easy to recognize by the umbellate spikes and large, rounded, cordate leaves, which are not peltate like those of *P. peltatum*, otherwise very similar. Reported from Costa Rica under the names *P. Dombeyanum* and *P. subpeltatum*.

**Piper umbricola** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 215. 1891. Rodeo de Pacaca, *Pittier 3238*. Also at Buenos Aires, Térraba, and San Ramón.

**Piper unauriculatum** Trelease, sp. nov.—Frutex nodosus sarmentosus, internodiis gracilibus breviusculis glabris purpurascentibus; folia oblonga vel oblongo-subobovata protracto-acuminata, basi subacuta, latere altero minute auriculato, 15 cm. longa 4.5–6 cm. lata, e medio inferiore vel inferius pinnatinervia, nervis 4–5×2, subtus puberula, in sicco firmo-papyracea, petiolo 5 mm. longo dense puberulo; spicae 50 mm. longae 2 mm. crassae, pedunculo 10 mm. longo subpuberulo.—El General, Prov. San José, 880 meters, *A. F. Skutch 2967* (type in U. S. Nat. Herb.).

**Piper unguiculiferum** Trelease, Contr. U. S. Nat. Herb. 26: 149. 1929. Pejivalle, Prov. Cartago, 900 meters, *Standley & Valerio 47003*.

**Piper urophyllum** C. DC. Anal. Inst. Costa Rica 9: 170. 1897. *P. sarapiquinum* C. DC. op. cit. 166 (Río Sarapiquí, *Biolley 7437*). Río Tuis, *Tonduz 8159*. Atlantic coast, ascending to Cartago.

**Piper urostachyum** Hemsl. Biol. Centr. Amer. Bot. 3: 57; 5: *pl. 72*. 1882. *P. lanuginosum* C. DC. Anal. Inst. Costa Rica 9: 159. 1897 (Río Naranjo, *Tonduz 7519*). Atlantic coast. Also in Nicaragua.

**Piper uvitanum** C. DC. Bot. Gaz. 70: 182. 1920. La Uvita, Limón, *Pittier 12690*.

**Piper valetudinarii** Trelease, Contr. U. S. Nat. Herb. 26: 178. 1929. Near San José, *Tonduz 7235*.

**Piper vallicolum** C. DC. Bull. Soc. Bot. Belg. 30, pt. 1: 222. 1891. Río Jarís, Pacaca, *Pittier 3298*. Tierra caliente of the Pacific slope, and Atlantic slope of Guanacaste.

**Piper ventoleranum** Trelease, Contr. U. S. Nat. Herb. 26: 184. 1929. La Ventolera, southern slope of Volcán de Poás, 1,700 meters, *Standley 34712*.

**Piper venulosum** Trelease, Contr. U. S. Nat. Herb. 26: 132. 1929. *Cordoncillo*. Near San Ramón, *Brenes 14192*. Collected also at Tilarán, Peña Blanca, and Buenos Aires. A shrub 2.5–3.5 meters high.

**Piper veraguense** C. DC. in DC. Prodr. 16, pt. 1: 294. 1869. Based upon specimens collected by Warscewicz in Costa Rica or Panama; not collected in recent years; perhaps the same species as *P. peltaphyllum* C. DC.

**Piper verbenanum** C. DC. Anal. Inst. Costa Rica 9: 165. 1897. *P. salinasanum* var. *verbenanum* C. DC. Candollea 1: 97. 1923. La Verbena, near San José, *Tonduz 8867*. Vicinity of San José and on La Carpintera. Reported under the name *P. mollicomum*.

**Piper verruculaepetiolum** Trelease, sp. nov.—Frutex, nervis folii subtus puberulis exceptis glaber, ramis aliquanto geniculatis, internodiis floriferis subgracilibus breviusculis triquetris pallido-granulosis; folia subelliptica subacuminata, basi valde obliqua inaequaliter cordulata, 16–21 cm. longa 8–10 cm. lata, e 2 tertiis inferioribus pinnatinervia, nervis circiter 6+7, in sicco tenuiter papyracea, petiolo circiter 7+3 mm. longo dense granuloso basi

tantum alato; spicae 70 mm. longae 3 mm. crassae mucronatae, pedunculo 8 mm. longo minute granuloso; bracteae triangulari-subpeltatae glabrae; baccae subcylindraceae truncatae, stigmatibus 3 minutis sessilibus.—Farm Six, Changuinola Valley, Province of Bocas del Toro, Panama, *V. C. Dunlap 494* (type in Herb. Field Mus.).

**Piper verruculigerum** Trelease, Contr. U. S. Nat. Herb. 26: 165. 1929. *Cordoncillo.* Quebrada Serena, near Tilarán, Guanacaste, 700 meters, *Standley & Valerio 46239.* Region of Tilarán. A shrub 2 meters high.

**Piper verruculosum** C. DC. Journ. Bot. 4: 215. 1866. *P. nudicaule* C. DC. Anal. Inst. Costa Rica 9: 162. 1897 (El Tablazo, *Tonduz 7922*). Cerro de Candelaria, *Hoffmann 8.* Region of San Ramón.

**Piper vicinum** Trelease, Contr. U. S. Nat. Herb. 26: 157. 1929. Zhorquín, 700 meters, *Tonduz 6635.*

**Piper villistipulum** Trelease, Contr. U. S. Nat. Herb. 26: 162. 1929. El Muñeco, Río Navarro, Prov. Cartago, 1,400 meters, *Standley 33438.* Region of El Muñeco.

**Piper villosisquamulum** Trelease, Contr. U. S. Nat. Herb. 26: 158. 1929. La Hondura, Prov. San José, 1,300–1,700 meters, *Standley 37799.* A shrub 2 meters high.

**Piper virgultorum** C. DC. Bot. Gaz. 70: 173. 1920. Tsuritkub, Talamanca, *Tonduz 8650.* Atlantic coast.

**Piper viridifolium** Trelease, Contr. U. S. Nat. Herb. 26: 139. 1929. El Muñeco, Río Navarro, Prov. Cartago, 1,400 meters, *Standley & Valerio 51034.*

**Piper viridispicum** Trelease, Contr. U. S. Nat. Herb. 26: 138. 1929. Finca Montecristo, near El Cairo, Prov. Limón, *Standley & Valerio 48536.*

**Piper virillanum** C. DC. Anal. Inst. Costa Rica 9: 158. 1897. Río Virilla, San José, *Tonduz 9831.* Region of San Ramón, 600 meters.

**Piper vitabile** Trelease, sp. nov.—Frutex ubique molliter breviter pubescens, internodiis floriferis brevibus crassiusculis, folia sublanceolata acuminata, basi oblique cordulata, 9–10 cm. longa 3.5–4.5 cm. lata, infra medium pinnatinervia, nervis 4–5×2, petiolo 5 mm. longo; spicae (deformatae?) aliquanto curvae, juveniles 30 mm. longae 2 mm. crassae, pedunculo 5–10 mm. longo.—Buenos Aires, 480 meters, *Manuel Valerio 894* (type in Herb. Field Mus.).

**Piper xanthoneurum** Trelease, Contr. U. S. Nat. Herb. 26: 132. 1929. Cerro de La Carpintera, Prov. Cartago, 1,500–1,800 meters, *Standley 35505*. Also at Turrialba.

**Piper xanthostachyum** C. DC. Anal. Inst. Costa Rica 9: 169. 1897. Río Tuis, *Tonduz 6747*. Also in El General.

**Piper xiroresanum** C. DC. Anal. Inst. Costa Rica 9: 169. 1897. Shirores, Talamanca, *Tonduz 9271*.

**Piper zacatense** C. DC. Anal. Inst. Costa Rica 9: 161. 1897. Boca Zacate, *Pittier 6828*.

**Piper zentanum** C. DC. Bot. Gaz. 70: 170. 1920. Hacienda de Zent, Prov. Limón, *Tonduz 14649*.

**Piper zhorquinense** C. DC. Anal. Inst. Costa Rica 9: 159. 1897. *P. submarginense* C. DC. in Donn. Smith, Enum. Pl. Guat. 6: 39. 1903, nomen. Río Zhorquín, *Tonduz 8523*. Plains of the Atlantic coast.

**Piper zingiberinum** Trelease, sp. nov.—*Caña de muela*. Frutex nodosus glaber *Zingiberide* olens circiter 2-metralis, internodiis floriferis brevibus gracilibus; folia lanceolata vel ovata sensim acuta, basi subacuta altero latere aliquanto breviore, 7–9 cm. longa 3–4 cm. lata, infra medium pinnatinervia, nervis gracilibus 3×2 subtus prominentibus, in sicco crassa anguste revoluta et saepe conduplicata, petiolo circiter 5+2 mm. longo; spicae 30–40 mm. longae 1 mm. crassae, pedunculo 5 mm. longo; bracteae rotundo-subpeltatae.—Santa Clara hills, 1,500 meters, *H. E. Stork 2594* (type in herb. Univ. Illinois). The plant is reported to be used as a remedy for toothache.

**Piper zonulatispicum** Trelease, Contr. U. S. Nat. Herb. 26: 164. 1929. El Muñeco, Río Navarro, Prov. Cartago, 1,500 meters, *Standley & Valerio 51116*. Region of Río Navarro.

## CHLORANTHACEAE

The family is represented in Central America by a single genus.

### HEDYOSMUM Swartz

Aromatic trees or shrubs with very brittle branches; leaves opposite, usually dentate, the petioles united to form a sheath, this provided with small stipules on the margins; staminate flowers spicate; fruit a small drupe.

**Hedyosmum Artocarpus** Solms. *Vara blanca*. Common in forests of the central volcanoes, also in the mountains of Cantón

de Dota; 1,200–2,800 meters. Extending to southern Mexico. A shrub or small tree 3–10 meters high; pistillate flowers arranged in a dense head. The wood is soft, the bark whitish. Pittier reports that the fruits are edible and have an agreeable flavor.

**Hedyosmum Brenesii** Standl., sp. nov.—Frutex 1–2-metralis monoicus glaber, ramis gracilibus subteretibus brunnescentibus; folia vix ultra 3 mm. longe petiolata tenuiter coriacea, lamina linearilanceolata 7–12 cm. longa 1–1.7 cm. lata versus apicem longe angustissime attenuata basi acuta vel subobtusa arcte et subgrosse adpresso-serrata, dentibus subincurvis, supra in sicco fusca nervis obscuris, subtus paullo pallidiore brunnescente, costa gracili elevata, nervis obscuris; cymulae laxe paniculatae, femineae pauciflorae, bracteis latis ovatis vel ovalibus obtusis, spicis masculis dense multifloris cylindraceis ad 1 cm. longis dense multifloris.—In forest, La Palma de San Ramón, 1,150 meters, *Brenes 4620* (type in Herb. Field Mus.); also, from the same locality, *Brenes 4027* and *3731*. From all Central American species of the genus this is distinguished at once by the very long and narrow leaves.

**Hedyosum calloso-serratum** Oerst. Vid. Medd. Kjoebenhavn 1856: 40. 1857. Volcán de Irazú, 2,700 meters, *Oersted*. Common in forests of the central region, and descending on the Atlantic slope to Guápiles; region of San Ramón. Also in Nicaragua. A shrub or tree of 3–8 meters; pistillate flowers spicate or paniculate. The fruits are white and exceedingly juicy.

## LACISTEMACEAE

### LACISTEMA Swartz

From Central America a single species is known.

**Lacistema aggregatum** (Berg.) Rusby. Forests and thickets of the Pacific coast, and almost certainly also of the Atlantic. Widely distributed in tropical America. A shrub or small tree, the leaves alternate, short-petiolate, elliptic or elliptic-oblong, 7–15 cm. long, acuminate, entire; flowers very small, bracteate and bracteolate, in small, dense, axillary, sessile and fasciculate spikes; fruit a somewhat fleshy, 3-valvate capsule containing usually a single seed.

## SALICACEAE. Willow Family

### SALIX L. Willow

From Central America there are known only three other species of this genus, the others being Guatemalan.

**Salix chilensis** Molina. *Sauce. S. Humboldtiana* Willd. Common in the central region, especially about Cartago and San José, doubtless in many other regions. Mexico to Patagonia. A tree of 8–15 meters, planted in many places and also naturalized but probably not truly native of the region, although it may have been here for a number of centuries. It is claimed that all the Costa Rican trees are pistillate, but I do not know whether this is actually the case or not. The flexible branches are employed commonly for making baskets and other articles.

## MYRICACEAE. Bayberry Family

### MYRICA L. Bayberry

Shrubs or small trees; leaves alternate, without stipules, short-petiolate, oblanceolate or obovate, dentate or entire, covered, especially beneath, with small, yellowish glands; flowers minute, of 2 sexes, arranged in short, axillary spikes; fruit a small drupe, covered with whitish wax.—Another species grows near the Atlantic coast in northern Central America.

**Myrica mexicana** Willd. *Arrayán. M. xalapensis* HBK. Common in the regions of Cartago and San Ramón, and probably elsewhere, in thickets and open forest. Ranging to Mexico. A shrub of 2–5 meters. By boiling the fruits in water, it is possible to obtain a greenish wax that is employed in some regions for making candles which burn with a characteristic, agreeable odor. In some regions of Central America the plant is called Arbol de cera.

**Myrica phanerodonta** Standl. Journ. Wash. Acad. Sci. 17: 164. 1927. Summit of Volcán de Poás, 2,645 meters, *Tonduz 10785*. Known only from the slopes of Poás and Barba, 2,200–2,645 meters. Endemic. A shrub of 2.5–3.5 meters.

**Myrica pubescens** Willd. *Encinillo*. Common in forests of the central region and Cantón de Dota, 1,000–1,800 meters. Also in Colombia. A shrub or tree of 2–9 meters, the leaves larger than those of the other two species.

## JUGLANDACEAE. Walnut Family

It is probable that there are in some parts of Costa Rica cultivated trees of *Juglans* (*nogal*), a genus represented by native species in Mexico and South America but not in Central America. The trees are cultivated occasionally in some parts of Central America. The English walnuts (*nogales*) imported into Costa Rica are the fruit of *Juglans regia* L. of Europe.

## ALFAROA Standl.

**Alfaroa costaricensis** Standl. Journ. Wash. Acad. Sci. 17: 78. 1927. *Gaulín.* Forests of El Muñeco, Río Navarro, Prov. Cartago, 1,400 meters, *Standley 33620.* Common in forests of the region south of Cartago, found also in La Estrella, Alto de La Estrella, and Juan Viñas; region of San Ramón; Turrialba, *Dita Keith 371.* Endemic. A tree of 5–12 meters or more; leaves mostly opposite, without stipules, with numerous narrow leaflets; flowers small, green, arranged in terminal spikes; fruit a small nut, similar to that of the genus *Carya.* The young leaves are handsomely colored with pink and dull red. An endemic genus, dedicated to Professor Anastasio Alfaro, formerly Director of the Museo Nacional, and tireless student of the Costa Rican fauna and flora.

## ENGELHARDTIA Lesch.

Another species is native in Chiapas, Mexico. Otherwise the genus is Asiatic.

**Engelhardtia pterocarpa** (Oerst.) Standl. Trop. Woods 12: 15. 1927. *Gavilán, Campana*(?). *Oreomunnea pterocarpa* Oerst. Vid. Medd. Kjoebenhavn 33. 1856. *Engelhardtia Oreomunnea* C. DC. Ann. Sci. Nat. IV. Bot. 18: 36. 1862. Between Naranjo and Tucurrique, *Oersted.* Valley of the Río Reventazón, at 700–1,500 meters. Endemic. A tree of 40–50 meters, the trunk 50–70 cm. in diameter; leaves alternate, pinnate, with 4–8 lanceolate leaflets; bracts of the pistillate spikes 4-lobate, in fruit very large and coriaceous; fruit a globose nut 1 cm. long. An interesting tree because of the fact that it is the only Central American representative of an Asiatic genus. The genus *Oreomunnea* was dedicated by Oersted to Don Francisco Maripa Oreamuno, who aided him in his botanical exploration of Costa Rica a century ago. Although botanists are not altogether in accord as to the genera to be recognized in this family, the present writer is of the opinion that it is impossible to maintain *Oreomunnea* as a distinct genus. Its wood is of good quality and is employed locally for house construction, interior finish, and other purposes.

## BETULACEAE. Birch Family

## ALNUS Hill. Alder

**Alnus acuminata** HBK. *Jaúl.* Common almost everywhere in the temperate region, at least before so much of the land was placed under cultivation, ascending the slopes of the volcanoes,

often forming small pure stands. Guatemala to Peru. A handsome tree, 3–10 meters high; leaves petiolate, broadly ovate, dentate, alternate; flowers minute, the staminate in elongate aments; fruit a short, hard, bracteate spike, resembling a cone. The name Aliso is given in Spain to species of *Alnus*. Their bark is rich in tannin.

### FAGACEAE. Beech Family

In Central America there occurs a single genus of this important group. To the family belongs also the beech (*Fagus; haya*) of Europe and North America.

### CASTANEA Hill. Chestnut

The species of the genus are native in Europe, Asia, and eastern North America.

**Castanea sativa** Mill. *Castaño.* Planted and fruiting at Desamparados, in the finca of Ricardo Batalla, *Estrella Umaña 1.* Native of southern Europe, well known for its edible seeds.

### QUERCUS L. Oak

Reference: Trelease, The American oaks, Mem. Nat. Acad. Sci. 20. 1925.

One of the most important genera of trees, with 370 species in North America, the great majority of them in Mexico. They are easy of recognition because of their unique fruit, an acorn (*bellota*). The wood is strong, hard, and heavy, and is one of the most used woods of the earth for furniture and construction of all kinds. The Costa Rican oaks constitute the principal element of almost all the forests of the temperate region (apparently there is only 1 in Guanacaste!), forming in many regions of the Meseta Central and Cantón de Dota extensive and almost pure stands. They ascend the slopes of the volcanoes to the limit of arborescent vegetation. Usually several species are found together, but, as a matter of fact, there is still very little known about the distribution of the Costa Rican species. The trees are so tall and usually so covered with epiphytes that walking or riding underneath them it is impossible to tell whether the trees one passes are alike or different. Let no one familiar with the oak forests of temperate Europe and North America suppose that the Costa Rican forests are at all similar in appearance, for they are not. The latter are composed of medium-sized or large trees, densely crowded together, and usually heavily laden with epiphytes, the ground underneath

being so heavily shaded that but few herbaceous plants grow in it. A visitor from the North might ride for days through such a forest without ever suspecting that oak trees grew there. Indian names reported for species of *Quercus* are: Sákira-kani (Guatuso); Kos (Cabécara, Bribrí); Kos-kra (Brunka).

**Quercus borucasana** Trelease, Mem. Nat. Acad. Sci. 20: 161. *pl. 315*. 1925. *Roble. Q. granulata* Liebm. Dansk. Vid. Selsk. Forh. 186. 1854. Volcán de Irazú, *Oersted 5, 3491*. Common in forests of the central region, 1,500–2,400 meters or more. Endemic. A tall tree, 9–25 meters high or taller, abundant in many places; leaves almost sessile, entire, oblong or lance-oblong, acute or acuminate.

**Quercus Brenesii** Trelease, Mem. Nat. Acad. Sci. 20: 186. *pl. 377*. 1925. *Roble, Encino, Roble negro*. Between San Ramón and San Mateo, *Brenes 14520*. Also Santa María de Dota, 1,500–1,800 meters; frequent in the region of San Ramón at 1,000–1,200 meters. Endemic. A tree of 6–25 meters; leaves almost sessile, oblanceolate, narrow-acuminate, coarsely serrate.

**Quercus citrifolia** Liebm. Dansk. Vid. Selsk. Forh. 187. 1854. *Encino*. Volcán de Irazú, *Oersted 6, 7, 3461*. Cartago; abundant in Cantón de Dota. Endemic. A tall tree; leaves oblong, entire, acute or acuminate, almost glabrous when fully developed.

**Quercus corrugata** Hook. *Roble, Encino*. Boruca; slopes of Volcán de Poás; abundant in Cantón de Dota; at 1,500–1,800 meters. Also in Guatemala. A tall or medium-sized tree; leaves long-petiolate, oblong or oblanceolate, acuminate, coarsely dentate, almost glabrous. Trelease has published also var. *ipalensis* (Mem. Nat. Acad. Sci. 20: 45. 1925; Volcán de Ipala, *Pittier 1869*), and there is a var. *microcarpa* Wenzig (Jahrb. Bot. Gart. Berlin 3: 192. 1884; *Polakowsky* in 1875 in the region of Dota).

**Quercus costaricensis** Liebm. Dansk. Vid. Selsk. Forh. 184. 1854. *Roble*. Volcán de Irazú, *Oersted 3465*. Common in forests of the central region and Cantón de Dota, ascending to 3,000 meters. Endemic. A tall tree; leaves small, oval or almost rounded, rounded or very obtuse at the apex and base, somewhat tomentose beneath, the veins impressed on the upper surface. There is also a forma *Kuntzei* Trelease (Mem. Nat. Acad. Sci. 20: 146. 1925; Volcán de Irazú, *Kuntze 2282*), common in the central region, and distinguished by having almost glabrous leaves, their veins not impressed on the upper surface.

**Quercus Endresi** Trelease, Mem. Nat. Acad. Sci. 20: 145. *pl. 280.* 1925. Without indication of the exact locality, *Endres.* Endemic. Leaves oblong or elliptic-oblong, acute or obtuse, entire, somewhat tomentose beneath or almost glabrous.

**Quercus eugeniaefolia** Liebm. Dansk. Vid. Selsk. Forh. 185. 1854. *Roble, Encino.* Without exact locality, *Warscewicz.* Common throughout the central region and in the Cantón de Dota, 1,400–2,100 meters; region of San Ramón. Endemic. A tree of 10–30 meters; leaves very narrow, oblong or oblong-lanceolate, narrowly acuminate, almost sessile, entire, glabrous. One of the most abundant of the local species. There is also a forma *petiolata* Trelease (Mem. Nat. Acad. Sci. 20:161. 1925; without definite locality, *Hoffmann 863*).

**Quercus irazuensis** Kuntze, Rev. Gen. 2: 641. 1891. *Roble.* Volcán de Irazú, 2,700 meters, *Kuntze 2344.* Also in the mountains of Dota, 2,700–3,000 meters. Endemic. A tall tree; leaves entire, more or less tomentose beneath when young, glabrous at maturity, oblong, acute, the veins very conspicuous.

**Quercus matagalpana** Trelease. Forests of the central region, 1,500–2,400 meters. Also in Nicaragua. A tall tree; leaves almost sessile, oblanceolate-oblong, acute, conspicuously undulate or somewhat serrate, sparsely hairy beneath when young.

**Quercus oleoides** Cham. & Schlecht. *Q. retusa* Liebm. Dansk. Vid. Selsk. Forh. 187. 1854 (Volcán de Barba, *Oersted 4*). Represented in Costa Rica by forma *australis* Trelease (Mem. Nat. Acad. Sci. 20: 114. 1925; Volcán de Barba, *Pittier 2607*). Volcán de Barba and Santa María de Dota; collected also between Guachipelín and Liberia, Guanacaste. Extending to Mexico. A tree, the leaves oblong, obtuse, entire, almost glabrous.

**Quercus oocarpa** Liebm. *Roble, Encino.* Common in the central region, 1,200–1,900 meters. Panama to Guatemala. A tall tree; leaves large, almost sessile, oblanceolate or obovate, acuminate, tomentose or pilose beneath, coarsely dentate.

**Quercus Pilgeriana** Seemen, Bull. Herb. Boiss. II. 4: 655. 1904. *Roble, Encino.* Río Ciruelas, *Pittier 2197.* Also Cuesta de Tarrazú and Santa María de Dota. Endemic. Leaves entire, narrowly lance-oblong, acuminate, glabrous, long-petiolate.

**Quercus rapurahuensis** Pittier ex Seemen, Bull. Herb. Boiss. II. 4: 654. 1904. El Copey, *Tonduz 11795.* Endemic; known only

from the region of the type. Leaves oblong-lanceolate, large, acute, entire or somewhat undulate, more or less tomentose beneath, long-petiolate.

Trelease reports for Costa Rica *Quercus sapotaefolia* Liebm., but in error, the species being a Guatemalan one.

**Quercus Seemanni** Liebm. *Roble, Encino.* Common in the central region, 1,500–2,400 meters. Also in Panama. A tall tree; leaves narrowly oblong or lanceolate, with evident but short petioles, entire, acuminate, glabrous. The species is closely related to *Q. eugeniaefolia* and probably not distinct.

**Quercus Tonduzii** Seemen, Bull. Herb. Boiss. II. 4: 656. 1904. *Roble negro.* Forests of El Achiote, Volcán de Poás, *Tonduz 10788.* Regions of Poás and San Ramón. Endemic. Leaves short-petiolate, oblong, entire, acute or acuminate, glabrous or nearly so.

**Quercus Wesmaeli** Trelease, Mem. Nat. Acad. Sci. 20: 172. *pl. 344.* 1925. Potrero del Alto, Volcán de Poás, 2,460 meters, *Pittier 773.* Also in Guanacaste (?) and El Copey, ascending to Cerro de Las Vueltas where it is an abundant species. Endemic. A large tree; leaves almost sessile, small, oblong-elliptic, acute or obtuse, entire, almost glabrous.

## ULMACEAE. Elm Family

Trees or shrubs; leaves alternate or opposite, stipulate, entire or dentate; flowers small, green, perfect or unisexual, apetalous.

### CELTIS L.

**Celtis iguanaea** (Jacq.) Sarg. Common in thickets of the coasts; ascending to the region of San Ramón, at 1,000 meters. Widely distributed in tropical America. A shrub or small tree, armed with short, hooked spines; leaves 3-nerved, dentate; fruit a small, yellow or reddish drupe. The branches often are elongate and clambering or somewhat scandent.

### CHAETOPTELEA Liebm.

The genus consists of a single species which is referred by some authors to synonymy under *Ulmus.*

**Chaetoptelea mexicana** Liebm. *Tirra, Ira* (?). Region of Cartago and Cantón de Dota. Panama to Mexico. A large tree, 15–40 meters high, unarmed, with grayish bark; leaves lance-oblong or oblong-ovate, serrate, acuminate; staminate flowers in short

aments, the pistillate in racemes; fruit a small samara, 5 mm. long. The wood is hard, heavy, strong, resistant, and dark or pale brown. In Panama the tree is known by the name Cenizo.

### LOZANELLA Greenm.

**Lozanella enantiophylla** (Donn. Smith) Killip & Morton, Journ. Wash. Acad. Sci. 21: 339. 1931. *Trema enantiophylla* Donn. Smith, Bot. Gaz. 22: 259. 1902. La Estrella, Prov. Cartago, *Cooper 325*. Forests of the central region, 1,400–2,400 meters. Mexico to Peru. A shrub or tree of 3–5 meters; leaves opposite, lanceolate or ovate, serrate; fruit a small drupe.

### TREMA Lour.

**Trema micrantha** (L.) Blume. *Jucó, Capulín, Vara blanca. Sponia canescens* HBK. Common on the Pacific slope, ascending to San José and Santa María de Dota; Cocos Island; probably also along the Atlantic coast. Widely distributed in tropical America, growing usually in thickets and abandoned land. A shrub or tree 2–10 meters high; leaves alternate, ovate or oblong-lanceolate, finely serrate; drupes red, only 2 mm. long. The wood is pale brown and soft. The bark contains a strong fiber.

## MORACEAE. Mulberry Family

Trees or shrubs, rarely herbs, usually with milky latex; leaves mostly alternate, entire, dentate or lobate, stipulate; flowers minute, green, of 2 sexes, variously arranged; ovary 1–2-celled, the ovules solitary.

### ARTOCARPUS Forst.

**Artocarpus communis** Forst. *Arbol de pan. Breadfruit.* Native of the East Indies and Pacific Islands, planted commonly in the tierra caliente and sometimes in places of greater elevation. In Costa Rica there are two varieties, one with sterile fruits and farinaceous pulp which is eaten as breadfruit; the other, less common, has fruit containing many large seeds, somewhat like chestnuts in appearance and of similar taste when cooked. The latex that exudes from cuts in the trunk, mixed with coconut oil, affords a kind of pitch employed for caulking small boats. When boiled with water, the latex gives a kind of rubber of inferior quality, which is sometimes used in treating wounds. Because of its symmetrical form and dense foliage, composed of handsome leaves, the breadfruit is one of the best shade trees for tropical regions.

**Artocarpus integrifolia** L. f. *Jackfruit.* Cultivated in San José in the garden of Doña Amparo Zeledón, and probably elsewhere. Native of the East Indies. A tree with much smaller, entire, oblong to oval leaves.

## BROSIMUM Swartz

Trees, the leaves short-petiolate, usually entire, with small stipules; flowers monoecious, the receptacles with numerous densely crowded flowers, the pistillate solitary in the center of the receptacle; fruit a large or small drupe containing a hard stone.

**Brosimum costaricanum** Liebm. Dansk. Vid. Selsk. Afh. V. 2: 334. 1851. *Ojoche.* Naranjo, *Oersted.* Common in forests of the coasts, ascending to Cantón de Dota and the region of Cartago, at 1,500 meters or less. Ranging to Honduras, where it is known by the name Masica. A tall or medium-sized tree, the leaves oblong to elliptic, cuspidate-acuminate, with about 10 pairs of nerves. Pittier states that the branches of this (and probably the other) species are cut and used as forage for stock, and that the roasted or boiled seeds are eaten. In the Yucatan region *Brosimum Alicastrum* is an important source of forage for oxen during the dry season.

**Brosimum heteroclitum** Donn. Smith, Bot. Gaz. 31: 121. 1901. Jiménez, Llanuras de Santa Clara, *J. D. Smith 5117.* Endemic. A scandent shrub, the leaves elliptic-oblong, finely serrate, 10–16 cm. long, acuminate, almost glabrous. A little known species, scarcely of this genus.

**Brosimum ramonense** Standl., sp. nov.—Arbor, ramulis tortuosis subteretibus, internodiis brevibus, novellis dense pilis fulvis hirsutis; folia majuscula brevissime petiolata coriacea, petiolo vix ultra 3 mm. longo saepe fere nullo; lamina lanceolato-oblonga 14–19 cm. longa 5–7 cm. lata abrupte acuminata, acumine angusto attenuato ad 2 cm. longo, basi plus minusve obliqua obtusa vel anguste rotundata, integra, supra in sicco fuscescens glabra vel glabrata, venulis prominulis minute reticulatis, subtus brunnescens ad nervos venasque patenti-pilosa, costa crassa elevata, nervis lateralibus utroque latere ca. 15 valde prominentibus arcuato-adscendentibus prope marginem arcuato-conjunctis, venis elevatis arcte reticulatis; fructus globosus basi et apice late rotundatus 2.5 cm. diam. breviter pilosus vel glabratus, basi bracteis paucis imbricatis latissimis ad 4 mm. longis fulcratus.—La Palma de San Ramón, September, 1928, *Brenes 6327* (type in Herb. Field Mus.). The type consists of

a leafy branch with a single detached fruit. There is some doubt as to the generic position of the tree but it is probably referable to *Brosimum*, and in this genus is well distinct from all other Central American species.

**Brosimum terrabanum** Pittier, Contr. U. S. Nat. Herb. 18: 69. *f. 76.* 1914. *Ojoche.* Peñas Blancas del General, 600 meters, *Pittier 12029.* Abundant in forests of the coasts. Panama to Guatemala. A very tall tree, the leaves entire, with about 15 pairs of nerves. This tree has the same uses as *B. costaricanum*, and the two species are much alike in all their characters. For this species and its close relatives there have been reported the following indigenous names: Bi (Bribrí) Kabá-krá (Brunka); Fe-guó (Térraba).

**Brosimum utile** (HBK.) Pittier. *Mastate.* Forests of the Atlantic tierra caliente. Extending to Venezuela. A tree of 20–25 meters, the trunk 40–50 cm. in diameter, the bark grayish; leaves oblong-elliptic, 10–30 cm. long, cuspidate, the stipules 2 cm. long; fruit 2–2.5 cm. broad, yellow. This is the celebrated cow tree or Palo de vaca found in Venezuela by Humboldt. The milky latex that runs from incisions made in the trunk looks like cow's milk and it is possible to drink it in the same manner. Pittier reports that he has drunk it in Costa Rica without disagreeable results. The bark was employed formerly by the Indians for making clothing, sails, blankets, and other articles. At a small dwelling on Cerro de Las Vueltas where we once passed a night, I obtained a piece of bark cloth used there as a curtain. I was told that it was made from a tree called Mastate, and it is probable, therefore, that even at the present time the manufacture of such bark cloth continues among the remote Indians.

**CASTILLA** Cervantes. Mexican rubber tree

Reference: Pittier, A preliminary treatment of the genus *Castilla*, Contr. U. S. Nat. Herb. 13: 247–279. 1910.

Trees, the leaves large, alternate, short-petiolate, entire or finely dentate, distichous; stipules large, caducous; flowers monoecious, inserted on the surface of a flat or concave, broad receptacle; fruit of numerous drupes.

**Castilla costaricana** Liebm. Dansk. Vid. Selsk. Skrivt. 2: 319. 1851. *Hule, Ule.* Turrialba, *Oersted*, Common in forests of the Atlantic coast, ascending to 1,000 meters. Probably also in Panama

and Nicaragua. A large tree, the leaves more or less cordate at the base; primary staminate inflorescences almost sessile, the peduncles less than 1 cm. long. From this species and *C. nicoyensis* is obtained the greater part of the rubber exported from Costa Rica. In past years there were made extensive plantations of this species, chiefly in the plains of San Carlos, but with the depreciated price of rubber these have not proved as successful as had been expected. Pittier states that tapping of the trees may begin when they are six years old and may be continued every six months for a long time, if necessary precautions are observed in the process. A normal and profitable production is estimated at 400–500 grams of rubber per tree. Among Indian names reported for this and other species are: Tsini, Tsiní (Bribrí, Cabécara); Serú (Térraba); Quirri (Guatuso).

**Castilla fallax** O. F. Cook, Science n. ser. 18: 438. 1903. *Hule macho, Hule blanco.* Valle del Río Diquís and Golfo de Osa, at 600 meters or less. Also in Panama. A tree of medium size; leaves obtuse at the base. This species does not produce marketable rubber, merely a resin that has but little rubber content. Its Brunka name is reported as Gsi-krá.

**Castilla nicoyensis** O. F. Cook, Science n. ser. 18: 438. 1903. *Hule, Ule.* Nicoya Peninsula, and in other parts of the Pacific coast. Perhaps also in Panama. A tree of 10–20 meters, the leaves cordate at the base; primary staminate inflorescences on peduncles more than 1 cm. long. Native names are Gsi-krá (Brunka); Serú, Soró (Térraba).

## CECROPIA L.

Trees with few branches, the trunk whitish and hollow; leaves large, long-petiolate, peltate and palmate-lobate; flowers very small, arranged in very dense, fasciculate aments.—The guarumos constitute a highly characteristic element of the forests of tropical America, and there are probably no other trees except palms that are so important in giving to the tropical forest its distinctive aspect, as compared with a forest of temperate regions. They grow most abundantly in cut-over lands of the tierra caliente but are found also in virgin forest in elevated regions. They always harbor small and savage ants, presenting an interesting case of symbiosis. From the bark of these trees the Costa Rican Indians obtain a strong fiber that they use for cordage. Indian names are: Cur (Bribrí); Icú (Guatuso); Prun, Bulbul (Rama); Kokrá, Kokuakrá (Brunka); Serung-uo (Térraba).

**Cecropia asperrima** Pittier. *Guarumo.* Pacific coast. Ranging to Guatemala. Pistillate spikes 3–5 cm. long, their peduncle 4–8 cm. long.

**Cecropia insignis** Liebm. *Guarumo.* Plains of the Atlantic coast. Also in Nicaragua. Fruiting spikes 12–15 cm. long.

**Cecropia mexicana** Hemsl. *Guarumo.* Common almost everywhere in the tierra caliente. Panama to Mexico. Flower spikes 20–40 cm. long.

**Cecropia Pittieri** Robinson, Proc. Calif. Acad. IV. 1: 389. 1912. Cocos Island, *Pittier.* Endemic.

**Cecropia polyphlebia** Donn. Smith, Bot. Gaz. 27: 442. 1899. La Palma, 1,460 meters, *Tonduz 12642;* region of San Ramón. Flower spikes 4.5–5.5 cm. long.

### CHLOROPHORA Gaud. Fustic

**Chlorophora tinctoria** (L.) Gaud. *Mora, Brasil.* Common in the Pacific tierra caliente. Widely distributed in tropical America. A tree as much as 20 meters high, the branches often provided with long thorns; leaves petiolate, ovate, acuminate, entire or serrate, sometimes lobate, almost glabrous; flowers dioecious, the staminate in elongate aments, the pistillate in globose heads; fruit a fleshy syncarp 1 cm. or more in diameter. The wood is bright yellow, hard, fine-grained, and durable. It was formerly an article of export, for use as a dyewood. The bark is employed in some parts of the tree's range for tanning.

### COUSSAPOA Aubl.

Trees or shrubs, usually epiphytic, at least when young, often also more or less scandent; leaves petiolate, entire, coriaceous, the large stipules caducous; flowers dioecious, in globose heads, the heads few or numerous.

**Coussapoa Brenesii** Standl., sp. nov.—Ramuli crassi nodosi ferruginei, internodiis brevibus glabris; folia petiolata subparva coriacea, petiolo circiter 2 cm. longo gracili glabro; lamina suborbicularis vel obovato-orbicularis 7.5–11 cm. longa 5.5–9 cm. lata apice late rotundata et breviter obtuso-apiculata, basi late rotundata vel rotundata, in sicco brunnescens, glabra, supra sublucida nervis non elevatis, subtus paullo pallidior e basi vel paullo supra basin palmatim 5-nervia, nervis elevatis, nervis 2 exterioribus latere exteriore nervos

3–4 emittentibus, nervo medio prope vel supra medium utroque latere nervos 2 emittente, venulis obscuris; inflorescentia 8 cm. longa et ultra laxe ramosa glabra, ramis gracilibus patentibus, capitulis numerosis usque 12 mm. longe pedunculatis globosis 5–6 mm. diam. densissime multifloris.—Cataratas de San Ramón, April, 1935, *Brenes 20542* (type in Herb. Field Mus.). Altogether unlike all other Central American species in the palmately nerved leaves, a character found, however, in certain South American species of *Coussapoa*.

**Coussapoa Donnell-Smithii** Mildbr. Notizbl. Bot. Gart. Berlin 10: 414. 1928. *Montano* (Guanacaste). Turrialba, Prov. Cartago, 480 meters, *J. D. Smith 4826*. Common in the Atlantic plains and in the mountains of Guanacaste. Endemic. A shrub or tree as much as 20 meters high, the leaves white and tomentose on the lower surface, truncate or subcordate at the base; pistillate peduncles branched. In Guanacaste it was stated that the seeds are poisonous to chickens.

**Coussapoa nymphaeifolia** Standl. Proc. Biol. Soc. Wash. 37: 50. 1924. Buena Vista, road to San Carlos, *O. F. Cook & C. B. Doyle 157*. Also in Panama. Leaves deeply cordate at the base, pubescent beneath; pistillate heads sessile, axillary, 1–2 cm. thick.

**Coussapoa panamensis** Pittier. Atlantic coast. Also in Panama. Leaf blades rounded or truncate at the base, tomentose beneath; pistillate peduncles simple, the flower heads 2–2.5 cm. in diameter.

**Coussapoa parviceps** Standl. Proc. Biol. Soc. Wash. 37: 51. 1924. Valle de Agua Buena, Cañas Gordas, 1,100 meters, *Pittier 11166*. Also at Orosi. Endemic. A tree 10 meters high; leaves glabrous; pistillate heads numerous, paniculate, only 3–4 mm. thick.

**Urostigma intramarginale** Liebm. Dansk. Vid. Selsk. Skrivt. V. 2: 328. 1851. *Ficus intramarginalis* Miq. Ann. Mus. Lugd. Bot. 3: 297. 1867. The type was collected at Turrialba by Oersted. A part of the original collection is in the Herbarium of Field Museum. It consists of leaves of *Coussapoa* and receptacles of some species of *Ficus*. If we consider the specific name, it is evident that it refers to the leaves, the result being that *Urostigma intramarginale* is actually a species of *Coussapoa*. Without inflorescences it is impossible to determine to which Costa Rican species the name pertains, and it is therefore necessary to place it, probably permanently, among the doubtful species of *Coussapoa*.

## DORSTENIA L.

Perennial herbs with rhizomes; leaves petiolate, membranaceous; flowers minute, green, monoecious, inserted on the upper surface of a large, plane or concave, more or less fleshy receptacle.

**Dorstenia choconiana** Wats. Wet forests of the Atlantic coast, and in Guanacaste; Golfo de Osa; region of San Ramón. Ranging to Guatemala. Stems elongate; leaves lobate, or lance-oblong and almost entire. The typical form of the species has lobate leaves; var. *integrifolia* Donn. Smith, which is found in Costa Rica, has almost entire leaves.

**Dorstenia Contrajerva** L. *Contrayerba*. Common in forests and thickets of the coast, ascending to San José. Widely dispersed in tropical America. Plants acaulescent; leaves more or less lobate; receptacles quadrangular. With the typical form is sometimes found var. *Houstoni* (L.) Bureau, with entire or merely angulate leaves. In some parts of Central America the dried rhizomes are employed for flavoring cigarettes. An infusion of the root is employed in Costa Rica as a febrifuge, and it has also other applications in domestic medicine.

**Dorstenia Drakena** L. Guanacaste, and probably in other regions. A species of wide distribution in tropical America. Plants acaulescent, the leaves undulate or somewhat lobate; receptacles rounded or oval, entire.

## FICUS L. Fig

Reference: Standley, The Mexican and Central American species of *Ficus*, Contr. U. S. Nat. Herb. 20: 1–35. 1917.

A vast genus, with representatives almost everywhere in the tropics of the world. In Central America there are about 35 species. They are easy of recognition by their fruits, which are hollow, usually globose receptacles with a minute aperture at the apex, the minute flowers inserted over the inner surface. Evidently flowers so well protected can not be fertilized by casual insects such as fertilize most flowers and one is, therefore, not surprised to find that the receptacles are inhabited by minute and localized insects that aid in fertilization. It is asserted that a different species of insect is found in each species of *Ficus*, which is interesting if true, and might enable the entomologist to aid the botanist in determining specific limits in this difficult group of plants!

Usually the wild figs germinate upon branches of trees, developing as epiphytes and producing innumerable aerial roots that finally

establish contact with the soil. Meanwhile the woody body of the plant develops rapidly, embracing the branches of the host tree, and developing numerous branches, the final result being the death of the tree upon which the fig plant began existence. The wood is soft and weak and without important uses. The trees, because of their dense crowns of handsome leaves, are excellent shade trees. In Salvador the wild figs are mentioned popularly as the "national tree." The fruits are edible, but since in most species they are small and dry, they seldom are eaten by people although greedily sought by birds, especially parrots and toucans, and other animals. The milky sap contains an inferior kind of rubber. From the bark of these trees the ancient Mexicans—perhaps also the Central Americans—prepared a kind of paper that they used for their manuscripts. Among Indian names reported for the species are: Detsí (Bribrí); Kon (Guatuso); Klis (Rama).

**Ficus Brenesii** Standl., sp. nov.—Arbor 6–8-metralis, ramulis crassis subteretibus brunnescentibus dense foliatis, novellis sparse adpresso-pilosis; stipulae 1 cm. longae ovato-acuminatae extus adpresso-pilosae; folia parva longe petiolata subcoriacea, petiolo 2–3.5 cm. longo gracili glabrato; lamina ovali-oblonga ad elliptica 7–9.5 cm. longa 3.5–5 cm. lata abrupte breviter acuminata, basi rotundata vel obtusa, glabra vel subtus secus costam sparse barbata, supra in sicco fuscescens, costa nervisque vix elevatis, subtus fere concolor, costa gracili elevata, nervis lateralibus utroque latere ca. 8 angulo semirecto vel paullo latiore adscendentibus remotis fere rectis prope marginem inaequaliter arcuato-conjunctis; receptacula sessilia geminata globosa ca. 5 mm. diam. basi et apice late rotundata glabra vel glabrata, ostiolo non prominente, involucro bilobo adpresso, lobis late rotundatis ad 3 mm. longis.—In pasture, La Palma de San Ramón, 1,250–1,300 meters, December, 1926, *Brenes 5193* (type in Herb. Field Mus.). Also *Brenes 3607*, without data. Noteworthy for the very small and sessile receptacles.

**Ficus Carica** L. *Higo.* Cultivated in some regions, as in Guanacaste, but the common cultivated fig is seldom seen in Central America. It thrives well in the drier parts of Mexico. Native of the Mediterranean region. Dry figs are imported in quantity for sale in Costa Rican markets.

**Ficus Colubrinae** Standl. Common on the Atlantic plains; Golfo Dulce. Panama to British Honduras. A small or medium-sized tree; fruits reddish, very small.

**Ficus costaricana** (Liebm.) Miq. Ann. Mus. Lugd. Bot. 3: 298. 1867. *Higuerón, Higuerón colorado. Urostigma costaricanum* Liebm. Dansk. Vid. Selsk. Skrivt. V. 2: 322. 1851. Pitahaya, *Oersted.* Meseta Central and Pacific slope. Panama to Guatemala. A tree 6–15 meters high, common in many regions.

**Ficus cotinifolia** HBK. *Higuerón.* Meseta Central to the Pacific coast. Ranging to Mexico. A large or medium-sized tree.

**Ficus crassiuscula** Warb. ex Standl. Contr. U. S. Nat. Herb. 20: 12. 1917. *Chilamate.* La Fortuna, Volcán de Irazú, *Pittier 16150.* Forests of the slopes of the volcanoes, extending to the coasts. Also in Panama. A large or medium-sized tree; fruits large, 1.5–3 cm. in diameter. It is probable that under this name there have been confused two distinct species, the tree of the volcanoes being true *P. crassiuscula.* This species ascends to a much greater elevation than any other local representative of the genus.

**Ficus elastica** Roxb. An ornamental tree, cultivated commonly in parks, native of the East Indies. The species differs from all native ones in its large and handsome leaves and in the oblong shape of its receptacles.

**Ficus eugeniifolia** (Liebm.) Hemsl. Biol. Centr. Amer. Bot. 3: 144. 1883. *Urostigma eugeniifolium* Liebm. Dansk. Vid. Selsk. Skrivt. V. 2: 329. 1851. Ujarás, *Oersted.* Collected also on the Pacific coast. Salvador.

**Ficus glabrata** HBK. *Higuerón, Chilamate.* Common on the Pacific coast and probably on the Atlantic; region of San Ramón. Guatemala to Brazil. A very large tree, as much as 40 meters high; fruits 1.5–4 cm. in diameter or larger, sweet and juicier than in most other native species. The fruits are rather good to eat.

**Ficus Hemsleyana** Standl. *Higuerón, Higo.* Common in the Meseta Central and probably in other regions. Panama to Guatemala.

**Ficus involuta** (Liebm.) Miq. *Palo de agua*(?). Pacific coast. Panama to Mexico. A tall or medium-sized tree with a broad crown.

**Ficus isophlebia** Standl. *Higuerón.* Nicoya. Also in Panama.

**Ficus Jimenezii** Standl. Contr. U. S. Nat. Herb. 20: 14. 1917. *Higuerón.* San José, *Otón Jiménez 17536.* Meseta Central to the

Pacific coast; sometimes planted in parks. Endemic. A large tree, common in the Meseta Central.

**Ficus lapathifolia** (Liebm.) Miq. *Higuerón.* Meseta Central; Osa; Guanacaste. Ranging to Mexico. A large tree.

**Ficus nitida** Thunb. *Laurel de la India.* Native of the East Indies, planted in many places as a shade tree. The large and beautiful fig trees in the park at Limón are of this species. Under favorable conditions this tree often assumes the banyan form, developing aerial roots that become fixed in the soil and form new trunks to support the wide crown of foliage.

**Ficus Oerstediana** Miq. Alajuela, Puerto Jiménez, and probably in other localities. A medium-sized tree; fruits only 5–6 mm. in diameter, the smallest produced by any native Central American species. Guatemala to Colombia.

**Ficus ovalis** (Liebm.) Miq. Ann. Mus. Lugd. Bot. 3: 298. 1867. *Urostigma ovale* Liebm. Dansk. Vid. Selsk. Skrivt. V. 2: 324. 1851. Guanacaste, *Oersted.* Ranging to British Honduras.

**Ficus padifolia** HBK. *Capulamate, Higuito. Urostigma sapidum* Liebm. Dansk. Vid. Selsk. Skrivt. V. 2: 327. 1851 (Cartago, *Oersted*). *F. sapida* Miq. Ann. Mus. Lugd. Bot. 3: 298. 1867. Meseta Central, and probably in other regions; region of San Ramón. One of the most common species of Mexico and Central America. A corpulent tree, sometimes with aerial roots.

**Ficus pumila** L. *Hiedra.* Cultivated sometimes in gardens, as at San José. Native of China and Japan. Easily recognized by its habit, the plant being a slender vine that adheres tightly by aerial roots to walls or to trunks of trees.

**Ficus radula** Willd. *Higuerón, Higuerón blanco.* Common on the coasts. Mexico to Brazil. A large or medium-sized tree with large, sweet fruits.

**Ficus Tonduzii** Standl. Contr. U. S. Nat. Herb. 20: 8. 1917. *Higuerón, Chilamate.* La Gloria de Juan Viñas, 800 meters, *Pittier 3665.* Common on the coasts; San Ramón, at 1,200 meters. Honduras to Colombia. A big tree, distinctive in its large and broad leaves, their thick nerves prominent on the lower surface.

**Ficus Torresiana** Standl., sp. nov.—Subgenus *Urostigma.* Ramuli crassi dense pilis albidis patenti-pilosi; folia permagna longiuscule petiolata; lamina ovata vel elliptico-ovata 25–40 cm.

longa et 16–28 cm. lata vel ultra, acuta vel breviter acuminata, basi late rotundata vel breviter cordata, basi 7-nervia, supra glabra, subtus breviter molliter pilosa, nervis lateralibus utroque latere 9–14 divergentibus; cetera ignota.—El Muñeco, south of Navarro, Prov. Cartago, 1,400 meters, *Standley 33535* (type in herb. Field Mus.). El Muñeco, *Standley & Torres 51107;* La Hondura, Prov. San José, 1,300–1,700 meters, *Standley 37833;* near Cachí, 1,000 meters, *Brade 16349;* Turrialba, *Oersted 14291.* Among all Costa Rican species this may be recognized easily by its extremely large leaves, copiously pubescent beneath. I have not seen the fruits, but the leaves alone are so different from those of all other Central American species that I do not hesitate to describe the plant as new. The tree has been referred previously to *F. intramarginalis,* but this name, as explained upon a preceding page, relates to a species of *Coussapoa.* Endemic. The species is dedicated to a highly esteemed friend, Professor Rubén Torres Rojas of Cartago, who accompanied me upon the excursion during which I first saw this interesting tree. Specimens were taken from the same tree two years later when I visited El Muñeco in company with Professor Juvenal Valerio.

**Ficus Tuerckheimii** Standl. Contr. U. S. Nat. Herb. 20: 13. 1917. *Higuerón.* La Fortuna, Volcán de Irazú, 1,575 meters, *Pittier 16149.* Also Río Turrialba. Ranging to Guatemala.

**Ficus velutina** HBK. *Higuerón, Chilamate.* Meseta Central to the Pacific coast; Cerro de La Carpintera, 1,600 meters. British Honduras to Venezuela. A large tree, easy of recognition because of the large, densely hairy leaves.

**Ficus Werckleana** Rossberg, Repert. Sp. Nov. 42: 60. 1937. Carrillo, 300 meters, *Wercklé 17436.* Also Santo Domingo de Golfo Dulce (*Tonduz 9887*), and collected by Koschny, without locality. Endemic. A large tree with rounded crown, related to *F. crassiuscula,* but differing in having the leaves rounded at the base and shortly obtuse-acuminulate at the apex, the lateral nerves 20–25 on each side, and in having more shortly pedunculate receptacles; leaves as much as 25 cm. long and 15 cm. wide.

## HELICOSTYLIS Trécul

Another species of the genus is found in Panama. The other members of the group are South American.

**Helicostylis montana** Pittier. Río Barú. Also in Panama. A tree of 25–30 meters with smooth, grayish bark; leaves short-

petiolate, elliptic-oblong, acuminate, 8–14 cm. long, glabrous above, somewhat pubescent beneath; flowers dioecious, in globose heads; pistillate receptacle with numerous fleshy drupes at maturity.

**Helicostylis urophylla** Standl., sp. nov.—Arbor 4–5-metralis, ramulis gracilibus flexuosis subdense foliatis dense pilis fulvis patenti-pilosis; stipulae deciduae brunneae ca. 8 mm. longae ovato-acuminatae extus dorso dense adpresso-pilosae; folia breviter petiolata crasse membranacea, petiolo 5–8 mm. longo dense pilosulo; lamina anguste oblonga vel lanceolato-oblonga 12–19 cm. longa 3–4.5 cm. lata apice abrupte caudato-acuminata, acumine lineari 2.5–3 cm. longo integro, basi paullo obliqua obtusa, subintegra vel praesertim apicem versus remote adpresso-serrulata, supra in sicco viridis tantum ad costam pilosula aliter glabra vel glabrata, nervis vix elevatis, subtus fere concolor praesertim ad costam nervosque breviter patenti-pilosa tactu mollis, costa gracili elevata, nervis lateralibus utroque latere ca. 15 angulo lato adscendentibus paullo curvis juxta marginem arcuato-conjunctis, venis prominulis laxe reticulatis; receptacula mascula in axillis geminata ad 6 mm. longe graciliter pedunculata globosa 5–6 mm. diam. dense multiflora, bracteis basalibus brevibus floribus vix aequalibus ovatis acutis imbricatis extus dense sericeis; receptacula feminea breviter pedunculata ovoidea ut videtur 1-flora, bracteis numerosis arcte imbricatis ovatis acutis dense minute sericeis.—In forest, La Palma de San Ramón, 1,200 meters, May, 1927, *Brenes 5536* (type in Herb. Field Mus.). Los Angeles de San Ramón, *Brenes 13578*. It is possible that perfect material will show that this plant is better referable to the genus *Olmedia* but, for the present at least, it seems preferable to place it in *Helicostylis*.

## MORUS L. Mulberry

**Morus insignis** Bureau. Las Nubes, Prov. San José, and region of El Copey, 1,500–1,800 meters. Also in Colombia and Peru. A tree of 6–10 meters; leaves elliptic or ovate, large, serrate; flowers monoecious, in slender aments 5–10 cm. long or longer. This mulberry (*morero*) of the high mountains of Costa Rica is noteworthy for the exaggerated size of its fruits, probably the longest that are known in the whole genus. Notwithstanding their great size, they are much inferior to cultivated forms because the drupes are relatively few and widely separated.

It is probable that there is cultivated *M. multicaulis* Perr., which has been introduced into various parts of Central America as food

for silkworms, as the result of attempts of too enthusiastic foreigners to obtain financial profit by trying to convince Central Americans of the practicability of establishing a silk industry in their countries.

### OGCODEIA Bureau

A single species occurs in Central America, the other members of the genus being South American.

**Ogcodeia Naga** (Pittier) Mildbr. Notizbl. Bot. Gart. Berlin 11: 420. 1932. *Naga. Naucleopsis Naga* Pittier, Contr. U. S. Nat. Herb. 13: 440. *pl. 83–85, f. 66, 67.* 1912. La Colombiana, Prov. Limón, 100 meters, *Pittier 13444.* Forests of the plains of Santa Clara; common in the region south of Río Pirrís. Also in Nicaragua. A tree 8–10 meters high; leaves distichous, short-petiolate, elliptic-oblong, 25–45 cm. long, acuminate, glabrous, with large stipules; pistillate receptacles axillary, sessile, 4 cm. broad, the outer bracts elongate, ovate-lanceolate, the flowers very numerous. The milky sap that exudes when the trunk is tapped has the appearance of cow's milk, and is reported to have a similar flavor.

### OLMEDIA Ruiz & Pavón

Trees or shrubs, the leaves short-petiolate, entire or dentate, narrow; flowers dioecious, the staminate in small heads, the pistillate solitary, bracteate; fruit a small drupe.—Another Central American species occurs in Panama.

**Olmedia falcifolia** Pittier, Contr. U. S. Nat. Herb. 13: 435. *f. 63.* 1912. Río Hacúm, near Térraba, 150 meters, *Tonduz 12101.* Valley of Río Diquís. Endemic. A small tree; leaves almost sessile, elliptic-oblong, acuminate, somewhat sinuate-serrate, rough to the touch.

**Olmedia tovarensis** Klotzsch & Karst. Suerre, plains of Santa Clara, 300 meters. Colombia and Venezuela. Leaves entire, glabrous. It is not certain that the Costa Rican specimens have been correctly determined.

### PEREBEA Aubl.

Three other Central American species occur in Panama.

**Perebea costaricana** Standl., sp. nov.—Arbor 4.5–5-metralis omnino glabra; folia magna pergamentacea oblonga ca. 28 cm. longa et 9 cm. lata brevipetiolata abrupte breviter caudato-acuminata, basi inaequilatera et rotundata, nervis lateralibus utroque latere ca. 12 angulo fere recto divergentibus; receptacula femina sub-

sessilia in statu florifero 1 cm. lata multiflora, bracteis rotundato-ovatis obtusis scaberulo-puberulis vel glabratis; styli rami brevissimi crassi minute puberuli.—Wet forest near Guápiles, Prov. Limón, 300–500 meters, March, 1924, *Standley 37027* (type in U. S. Nat. Herb.). A tree of 4.5–6 meters, the leaves large, oblong, about 28 cm. long and 9 cm. wide, abruptly caudate-acuminate, unequal at the base, glabrous; pistillate receptacles sessile, 1 cm. broad, many-flowered, the bracts ovate, obtuse; fruit with few globose, red drupes 1.5 cm. long.

## POULSENIA Eggers

The genus consists of a single species.

**Poulsenia armata** (Miq.) Standl. *Mastate. Inophloeum armatum* Pittier. Region of Turrialba (*Oersted*), and doubtless in other parts of the tierra caliente. British Honduras to Ecuador. A medium-sized tree with smooth bark, the branches and leaves provided with small prickles; leaves large, rounded-ovate, rounded and apiculate at the apex, glabrous, with large stipules; pistillate receptacles axillary, 3–7-flowered. The inner bark is composed of numerous layers of strong and interlaced fibers. It is employed by the Indians for making a kind of bark cloth used for hammocks, blankets, women's clothing, and even canoe sails. The preparation of cloth from bark of Moraceae is an art practiced in many parts of the earth.

## POUROUMA Aubl.

**Pourouma aspera** Trécul. *Guarumo, Guarumo de montaña.* Common in forests of the tierra caliente, at least on the Pacific side. Central and South America. A tree somewhat resembling the Cecropias but usually taller; leaves deeply lobate, not peltate, whitish beneath; flowers dioecious, paniculate; fruits ovoid, pubescent, 1.5 cm. long, with scant pulp. The fruits are eaten by birds and, it is reported, by the Indians of some regions of Central America. In Nicaragua the tree is called Guarumo macho.

## PSEUDOLMEDIA Trécul

Two other species are known from Central America.

**Pseudolmedia oxyphyllaria** Donn. Smith. *Ojoche* (Guanacaste). Guanacaste and Province of Alajuela. Ranging to Veracruz. A tree of 6–15 meters; leaves short-petiolate, lance-oblong, 10–18 cm. long, acuminate, entire, glabrous; flowers dioecious, the staminate in small heads, the pistillate subtended by numerous imbricate, sericeous bracts; fruit a small drupe. The tree is common in the

lowlands of Guanacaste, where during the dry season the branches are cut to serve as forage for oxen. It is stated that the seeds are edible, and that they are utilized for making a kind of tortilla, but it may be that there is here some confusion with the genus *Brosimum*.

### TROPHIS L.

Unarmed trees with dentate or entire leaves; flowers dioecious, minute, green, in elongate aments; fruit a small drupe with scant flesh and a large stone.

**Trophis macrostachya** Donn. Smith, Bot. Gaz. 40: 10. 1905. Las Vueltas, *Tonduz 8124*. Common on the plains of the Atlantic coast; region of San Ramón. Also in Panama. A tall tree, the leaves short-petiolate, oblong, 15–22 cm. long, more or less serrate; pistillate flowers pedicellate.

**Trophis racemosa** (L.) Urban. *T. americana* L. Guanacaste, and probably in other parts of the Pacific coast if not also along the Atlantic. A species of wide distribution. A small or medium-sized tree; leaves 8–15 cm. long, entire or somewhat serrate; pistillate flowers sessile; fruits red, 1 cm. long. In Panama this tree is known by the name Ramón. In Yucatan the branches and leaves are used as forage for cattle.

### URTICACEAE. Nettle Family

Herbs, shrubs, or small trees, sometimes provided with stinging hairs; leaves simple, alternate or opposite; flowers monoecious or dioecious, apetalous, small, green or whitish; fruit an achene, the perianth sometimes persistent and becoming succulent.

### BOEHMERIA Jacq.

Herbs or shrubs with opposite or alternate leaves, without stinging hairs; leaves dentate.—Five species are known from Central America.

**Boehmeria aspera** Wedd. Wet forests of the central region and of the Atlantic slope. Also in Colombia. An herb about a meter high.

**Boehmeria caudata** Swartz. *B. flagelliformis* Liebm. Dansk. Vid. Selsk. Skrivt. V. 2: 310. 1851 (Aguacate, *Oersted*). Also at Las Vueltas. A species of wide distribution in tropical America.

**Boehmeria cylindrica** (L.) Swartz. Marshy places of the Atlantic coast. A species of wide distribution in America. Plants herbaceous.

**Boehmeria ulmifolia** Wedd. Forests of the central region, at 900–1,500 meters. Mexico to Panama. A shrub of 1–3 meters.

### FLEURYA Gaud.

**Fleurya aestuans** (L.) Gaud. *Ortiga.* Banana plantations and abandoned land of the Atlantic coast. A species of wide distribution. An herb, covered with stinging hairs; leaves alternate, ovate.

### MYRIOCARPA Benth.

Trees or shrubs, without stinging hairs; leaves alternate, dentate or almost entire; flowers whitish, in very long, ament-like, pendent spikes.—Five species are known in Central America.

**Myriocarpa inaequilateralis** Liebm. Dansk. Vid. Selsk. Skrivt. V. 2: 306. 1851. Aguacate, *Oersted.* Endemic(?). Arborescent, the leaves oblong.

**Myriocarpa longipes** Liebm. Dansk. Vid. Selsk. Skrivt. V. 2: 306. 1851. Aguacate, *Oersted.* Common in forests of the tierra caliente, ascending the mountains to 1,000 meters or higher; region of San Ramón. Panama to Mexico. A shrub or tree 3–6 meters high, the leaves ovate, finely dentate; achenes ciliate.

**Myriocarpa yzabalensis** (Donn. Smith) Killip. *Ortiga.* Common in forests of the Pacific slope. Guatemala to Panama. A shrub or tree of 2–6 meters, the leaves broad; achenes not ciliate.

### PARIETARIA L.

In Central America there is a single species.

**Parietaria debilis** Forst. Río Birrís, in open, moist places. A species of wide distribution in temperate rather than tropical regions. A weak, fragile herb; leaves alternate, ovate, entire, 1–2 cm. long; flowers green, polygamous, in small cymes.

### PHENAX Wedd.

Shrubs or herbs; leaves alternate, petiolate, dentate; flowers monoecious, in dense, axillary glomerules, the bracts brown and scarious.

**Phenax angustifolius** (HBK.) Wedd. *Boehmeria angustifolia* HBK. Tierra caliente, ascending the mountains to 1,000 meters or more. Ranging to Colombia. A shrub 1–2.5 meters high; leaves narrowly lanceolate.

**Phenax hirtus** (Sw.) Wedd. Common in moist places of the central region, 500–1,800 meters; region of San Ramón. A species of wide distribution. An herb or shrub of 1–2.5 meters; leaves ovate, coarsely crenate.

**Phenax mexicanus** Wedd. Central region and Pacific slope. Mexico to Panama. A shrub or tree of 2–6 meters; leaves ovate, finely crenate.

**Phenax rugosus** (Poir.) Wedd. Common in the central region, descending to the forests of the tierra caliente. Mexico to Ecuador. An herb or shrub 1–3 meters high; leaves ovate, finely crenate.

### PILEA Lindl.

Low herbs, without stinging hairs, usually succulent; leaves mostly opposite, occasionally verticillate, entire or dentate, those of a pair often very unequal; flowers small.—A genus with more than 30 species in Central America, principally in the mountains.

**Pilea acuminata** Liebm. La Hondura, Prov. San José, and doubtless in other regions. Mexico; Colombia.

**Pilea angustifolia** Killip, Journ. Wash. Acad. Sci. 15: 295. 1925. Juan Viñas, Río Reventazón, 1,000 meters, *O. F. Cook & C. B. Doyle 181*. Region of San Ramón, at 1,300 meters. Endemic.

**Pilea auriculata** Liebm. Dansk. Vid. Selsk. Skrivt. V. 2: 299. 1861. *Adicea auriculata* Kuntze, Rev. Gen. 622. 1891. Cartago, *Oersted*. Common in forests of the central region, at 1,200–3,000 meters; region of San Ramón. Endemic.

**Pilea centradenioides** Seem. Golfo Dulce. Also in Colombia and Panama(?).

**Pilea Cornmanae** Killip. La Hondura, Prov. San José, 1,300–1,700 meters. Also in Chiriquí, Panama.

**Pilea costaricensis** Donn. Smith, Bot. Gaz. 20: 294. 1896. La Estrella de Cartago, 1,300 meters, *Cooper 5952*. Forests of the central region, at 1,200–1,700 meters. Endemic.

**Pilea dauciodora** Wedd. Forests of the central region. Guatemala to South America.

**Pilea diversissima** Killip, sp. nov.—Dioica, glaberrima; stipulae triangulares, deciduae; folia valde inaequalia et dimorpha, cuiusque jugi majore lineari-lanceolato vel oblongo-lanceolato, attenuato-acuminato, serrato vel serrulato, trinervio vel subtriplinervio,

petiolato, minore anguste spathulato vel anguste ovato; flores feminei in cymis brevibus, achaeniis ovatis.

Slender herb, repent on the branches of trees, glabrous throughout, much branched, the branches angular, densely covered with minute, linear and punctiform cystoliths; stipules triangular, 0.5 mm. long, soon deciduous; leaves membranous, dark green, densely covered above with punctiform and very short, linear cystoliths, at the margin the cystoliths larger and linear and fusiform, the under surface bearing inconspicuous, punctiform cystoliths and sparingly black-punctate, the leaves of a node strongly unequal and dissimilar, the larger linear-lanceolate or oblong-lanceolate, 2–7 cm. long, 0.3–1.5 cm. wide, attenuate-acuminate, cuneate at the base, sometimes subfalcate, serrate or serrulate nearly to the base, with the teeth strongly ascending, trinerved or subtriplinerved (nerves reaching to the apex of the blade), petiolate, the petioles 2–10 mm. long, the smaller leaves narrowly spatulate or rarely narrowly ovate, 5–7 mm. long, 1–2 mm. wide, obtuse, sessile or tapering to a very short petiole, subentire or crenate-serrulate above the middle; plants dioecious; pistillate flowers in compact, sessile or subsessile cymes up to 5 mm. long, the perianth segments about 0.5 mm. long, the achenes ovate, about 0.8 mm. long.—Type in the Herbarium of Field Museum, No. 853,546, collected in humid forest at Los Angeles de San Ramón, Costa Rica, altitude 1,030 meters, July 11, 1926, by A. M. Brenes (No. 4851). Represented also by the following numbers of the same collector, from this general region: *3786*, *4010*, *13198*, *13511*, all in Field Museum. Two additional collections *Brenes 15665* and *Standley & Valerio 45409*, both from the vicinity of Tilarán, belong to this species. What is probably a robust form of this is represented in the U. S. National Herbarium by *Standley & Valerio 49014*, from the vicinity of El Cairo, and *Dunlap 471*, from La Palma. In these the larger leaves are 8–15 cm. long and 1.5–3 cm. wide and the smaller ones up to 10 mm. long and 5 mm. wide. The relationship of *P. diversissima* is with the Guatemalan *P. pansamalana* Donn. Smith.

**Pilea Donnell-Smithiana** Killip, Journ. Wash. Acad. Sci. 15: 292. 1925. La Palma, Prov. San José, 1,460 meters, *Tonduz 12655*. Also at La Hondura de San José. Chiriquí, Panama.

**Pilea gracilipes** Killip. Common in forests of the central mountains, at 1,200–2,500 meters. Also in Chiriquí, Panama.

**Pilea herniarioides** (Swartz) Lindl. *P. deltoidea* Liebm. Dansk. Vid. Selsk. Skrivt. V. 2: 298. 1851 (Aguacate, *Oersted*). Meseta Central and Pacific slope. Ranging to Mexico and West Indies.

**Pilea hyalina** Fenzl. *P. Lundii* Liebm. Common in the Meseta Central and Pacific slope. Mexico to South America.

**Pilea irrorata** Donn. Smith. Slopes of the central volcanoes. Ranging to Chiapas.

**Pilea microphylla** (L.) Liebm. *P. serpyllacea* Liebm. Common in the tierra caliente of the Atlantic slope, ascending to the Meseta Central. A small, fleshy plant, sometimes on walls or in patios of houses; leaves entire, 2–9 mm. long. Widely distributed.

**Pilea nummulariifolia** (Swartz) Wedd. Established in Parque Vargas, Limón, *Quirós 464*. Introduced, probably from the West Indies.

**Pilea pallida** Killip, Journ. Wash. Acad. Sci. 15: 295. 1925. Salto de Sibubi, Río Sixaola, *Rowlee 376*. Endemic.

**Pilea pansamalana** Donn. Smith. Common in mountains of Guanacaste; La Hondura; region of San Ramón. Also in Guatemala. Sometimes epiphytic.

**Pilea parietaria** (L.) Blume. Common in the central region, in moist forest, sometimes growing upon walls. Ranging to Mexico and West Indies.

**Pilea Pittieri** Killip, Journ. Wash. Acad. Sci. 15: 298. 1925. Río de La Paz, Valle del Sarapiquí, 1,300 meters, *Pittier 14149*. Forests of the central region. Endemic.

**Pilea ptericlada** Donn. Smith, Bot. Gaz. 31: 121. 1901. Forests of Atirro, Prov. Cartago, 800 meters, *J. D. Smith 6779*. Tierra caliente of the Pacific coast; region of San Ramón, at 1,000 meters.

**Pilea pubescens** Liebm. Meseta Central to the coasts; region of San Ramón. Mexico to South America.

**Pilea purulensis** Donn. Smith. Atlantic coast and mountains of Guanacaste. Also in Panama.

**Pilea quichensis** Donn. Smith. Mountains of Guanacaste, 600 meters. Also in Guatemala.

**Pilea Standleyi** Killip, Journ. Wash. Acad. Sci. 15: 298. 1925. Las Nubes, Prov. San José, 1,500–1,900 meters, *Standley 38697*.

**Pilea Tuerckheimii** Donn. Smith. Las Nubes, Prov. San José, and region of El Muñeco, 1,300–1,900 meters. Also in Guatemala.

## POUZOLZIA Gaud.

Shrubs, the leaves usually alternate; flowers monoecious, in axillary glomerules.

**Pouzolzia guatemalana** (Blume) Wedd. Atlantic coast. Panama to Guatemala. Leaves entire, white and tomentose on the lower surface.

**Pouzolzia obliqua** Wedd. Common in forests of the coasts. Guatemala to Peru. A shrub a meter high, the leaves entire, green, oblique at the base.

**Pouzolzia occidentalis** Wedd. Forests of Río Changuinola, and doubtless in other parts of the Atlantic coast. A species of wide distribution. A shrub, the leaves entire, green, not oblique at the base.

**Pouzolzia phenacoides** Killip, Journ. Wash. Acad. Sci. 15: 299. 1925. Cerro de Piedra Blanca, above Escasú, Prov. San José, *Standley 32484*. Also on the slopes of Poás, 1,700 meters. Endemic. A shrub 1–1.5 meters high; leaves dentate.

## URERA Gaud.

Shrubs or small trees, usually with stinging hairs; leaves alternate, petiolate; flowers mostly dioecious, green or whitish, in axillary panicles; achene enclosed in the fleshy, accrescent perianth.

**Urera alceifolia** Gaud. *Mata Cartago*. Atlantic coast and Cantón de Dota; region of San Ramón. Mexico to Panama. A shrub 2–5 meters high; leaves crenate-dentate; fruits red or orange. The plant is handsome when covered with its bright-colored fruits.

**Urera baccifera** (L.) Gaud. *Ortiga*. Meseta Central to the Pacific coast. A species of wide distribution. A shrub or tree of 2–7 meters; leaves broad, very coarsely dentate; all parts of the plant armed with stout, spine-like, whitish hairs; fruits white. This shrub is one of the most dangerous plants of Central America, well known almost everywhere in the region. When one is struck by the coarse hairs the effect is almost like that of an electric shock, and there often follows the most intense pain that may last, in decreasing degree, for several or many hours, with attendant inflammation of the skin. The plant is often used for hedges, which few larger animals care to penetrate. In many parts of Central America the plant is known by the name Chichicaste, a word of Nahuatl origin.

**Urera caracasana** (Jacq.) Griseb. *Ortiga, Ortiga blanca, Tabaquillo, Crespón. Urtica verrucosa* Liebm. Dansk. Selsk. Skrivt. V. 2: 295. 1851 (Irazú, 2,400 meters, *Oersted*). Common in many places, Meseta Central to the coasts, in forest or thickets. A species of wide distribution. A shrub or tree 3–9 meters high, the leaves

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large and broad, crenate-dentate; fruits red or orange. A handsome shrub when covered with the fruits. The hairs are much more slender than those of *U. baccifera*.

**Urera elata** (Swartz) Griseb. *Ortiga. Urtica corallina* Liebm. Dansk. Vid. Selsk. Skrivt. V. 2: 295. 1851 (Aguacate, *Oersted*). *Urera corallina* Wedd. in DC. Prodr. 16, pt. 1: 90. 1869. Forests of the central region and the Pacific slope. Guatemala to Panama; Jamaica. A shrub 3–5 meters tall or larger; leaves large, crenate, the hairs few and slender.

**Urera laciniata** Wedd. *Ortiga.* Atlantic coast, and in Guanacaste. Ranging to Peru. A shrub of 1–4 meters; leaves deeply lobate; hairs thick and stinging very painfully. The species seems to be rather rare in Costa Rica but I have seen it in a few localities. The leaves are sometimes purple on the lower surface.

### URTICA L. Nettle

Herbs with opposite, dentate leaves, furnished with slender, stinging hairs; flowers small, green, in spikes, panicles, or axillary glomerules, monoecious or dioecious.

**Urtica chamaedryoides** Pursh. *Chilacaste.* Forests and meadows of the volcanoes. A species of wide distribution in America.

**Urtica copeyana** Killip, sp. nov.—Caulis erectus simplex pilis albis brevibus reflexis pubescens et sparse setis gracilibus rectis armatus; stipulae deciduae; petioli 1.5–5.5 cm. longi minute pubescentes et sparse setosi; lamina ovata vel late ovato-lanceolata 6–11 cm. longa 4–8 cm. lata supra setis paucis laxis armata, subtus glabrescens, acuminata, basi cordata et 3–5-nervia, nervis conspicuis stramineis, glabra, margine grosse serrata, serraturis denticulatis 5 mm. latis; spicae graciles 3.5–5 cm. longae 2.5–3 mm. crassae, quoque nodo 3–5, simplices, rare basi ramosae, dense pubescentes, androgynae vel unisexuales; flores masculi non visi; flores feminei in glomerulos subcontiguos dispositi, perianthii segmentis exterioribus 0.7 mm. longis, interioribus orbicularibus 1 mm. longis latisque extus pilosulis; achaenium late ovatum.—Type in the U. S. National Herbarium, No. 799,382, collected along the shores of Río Pedregoso at El Copey, alt. 1,800 meters, February, 1898, *A. Tonduz 11929*.

**Urtica nicaraguensis** Liebm. *Ortiga.* Forests of the central mountains. Also in Nicaragua. The plant stings painfully.

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